

# International Hatchery Practice

Volume 30 Number 2 (2015)

Practical information for better breeding and hatching

## PERFORMANCE

*Feeding the breeder of today to optimise results.*

## EGG QUALITY

*Protecting eggs from the effects of mycotoxins.*

## HATCHERY AUTOMATION

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# FertileThoughts

**D**o stresses in the hatchery have a bigger impact on overall bird performance than many of us first thought?

First hatched chicks are subjected to the environment of the hatcher until they are eventually pulled. This environment is dusty and at a temperature and humidity that favours the hatching process rather than the hatched chick. In addition, formalin may have been used and by the time these first hatched chicks are pulled they will, to a degree, be dehydrated.

Then what happens? The chicks are tipped out of their hatcher baskets and subjected to sexing and grading and many are also vaccinated by injection and/or spray. They are then held in boxes, often not at an optimal temperature, before being subjected to a journey, which can be prolonged, to the farm they are to be placed on.

Placement is often a fast tipping operation and then these chicks are 'encouraged' to eat and drink – something that might not be too appealing after their adventures of the previous 24 hours or more.

If these chicks are going to perform well all their exertions must not adversely affect their ability to feed and drink. Thus, as managers, we must minimise stresses on young chicks. Some obvious stresses, such as debeaking, detoeing and desnooding, are still practised. Can this be justified in 2015?

In recent years we have seen the benefits that can be derived from in ovo vaccination in the hatchery and these are, in no small part, due to the fact that we are vaccinating the embryo and not the chick.

Even so, the chick is still subjected to a whole variety of other handling stresses.

As managers we should be looking all the time for ways to minimise stresses and keeping our chicks comfortable.

Some producers have 'chick welfare officers' and undertake chick welfare audits. This is very commendable, but what do they achieve and how valuable are they?

Just think how much easier life would be for us and stress free for the chicks if we had no hatchers or day old processing!

## Cover Picture:

**A thirst for knowledge!**  
(photo courtesy of HatchTech)

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# WorldFocus

An executive summary of key international issues

## Genomics

*Opening up a new can of worms?*

Modern technologies such as gene mapping and genomic fingerprinting do not just apply to poultry, they can be applied to all organisms, including viruses and bacteria. This will provide a whole new dimension to our understanding of the epidemiology of diseases and the spread of zoonotic pathogens such as Salmonella Spp. Now, instead of just being able to identify the pathogen, we will be able to identify every genetic variation of it. Thus, if a particular variant of salmonella is picked up on your breeding farm and in a food poisoning incident in Outer Mongolia there must be a link. Therefore, it will be much easier to confirm sources of salmonella and point the finger of blame!

## Genomics

*Are there two sides to the coin?*

Gene mapping and genomic fingerprinting could be great tools for veterinarians and epidemiologists to unravel disease problems. For example, if we have an on-going Mycoplasma gallisepticum or Salmonella enteritidis PT8 problem, we will now be able to determine whether all the isolates come from the same specific source or not. If it is the former, we can find the source and eliminate the problem. If it is the latter and multiple sources are involved, then we have a real mess to sort out and less chance of staying free of the pathogen in question. This is already being done with HPAI H5N1 and provides a lot of useful epidemiological information for tracking the sources and spread of this disease.

## Salmonella

*An ever present threat?*

Following the successful control of Salmonella enteritidis some years ago one would have hoped that this problem would have been confined to the history books. Unfortunately this has not been the case as demonstrated by the dispersal of S. enteritidis across various countries from a German egg packer and the dissemination of S. enteritidis via day olds from a Welsh hatchery to over 20 broiler farms in the UK and Ireland. We will probably never know where these two salmonellas came from, but one thing is obvious – that, somewhere, reservoirs of S. enteritidis do exist. This being the case, we can not afford to relax our salmonella control programmes or our biosecurity!

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<sup>1</sup>Avakian AP, Wakenell PS, Bryon T, Schaeffer JL, Williams CJ, Whitfill C. *In ovo* administration of Marek's disease vaccine: Importance of vaccine deposition site in the fertile egg, in *Proceedings, 51st Western Poultry Disease Conference* 2002; 119-121.

<sup>2</sup>Barbosa T, Williams C, Villalobos T. Efficacy and Marek's disease protection comparison between different vaccination methods, in *Proceedings, 18th Congress World Veterinary Poultry Association* 2013; 217.

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# Feeding the breeder of today to optimise performance results

by Dr Eija Helander, Aviagen Ltd, Newbridge, Midlothian, EH28 8SZ, Scotland, UK.

The reproductive potential of the modern broiler breeder female is high and it is still improving year by year. Careful lifetime management and nutrition are essential for keeping the birds in optimal condition and achieving the best possible chick output numbers.

## Background

The growth of all living beings follows more or less the same pattern: early on, growth is very fast, and it then slows down at puberty and remains slow or stops in adulthood.

Broiler breeders need to keep growing during their whole life but in a controlled manner. Overfed birds do not perform well, their egg quality is poor and they are more susceptible to diseases and higher morbidity. Underfed birds lack fat reserves which are essential for optimal reproductive function.

Recommendations for growth rate and body size for different breeds and sexes are given by breeding companies.

Breeders with optimal weight and balanced body composition are capable of producing at least 145 chicks over their 40-week produc-

tive life, and this production potential is constantly improving.

## Proper rearing is the base

The main factors influencing the lifetime reproductive performance of a flock are established during the rearing period. Nutrition from hatch to 4-5 weeks of age must focus on ensuring the proper development of the skeleton and legs, feathers, digestive, cardiovascular, and immune systems as well as a highly uniform development of birds within the flock.

Controlled feeding of broiler breeders in rear is of benefit to the laying period in a number of ways. The age of sexual maturity is easier to optimise, egg production and persistency are increased, ovarian function is improved and the number of abnormal eggs reduced. Controlled feed intake also leads to a better fertility and increased livability.

A well balanced diet has to provide essential amino acids, minerals, trace elements and vitamins in sufficient quantities. The recommended protein content of a starter diet containing 11.7 MJ/kg (2800 kcal/kg) of AME is 19%, with a 0.95% digestible lysine content.

Recommendations for grower diet energy content range from low

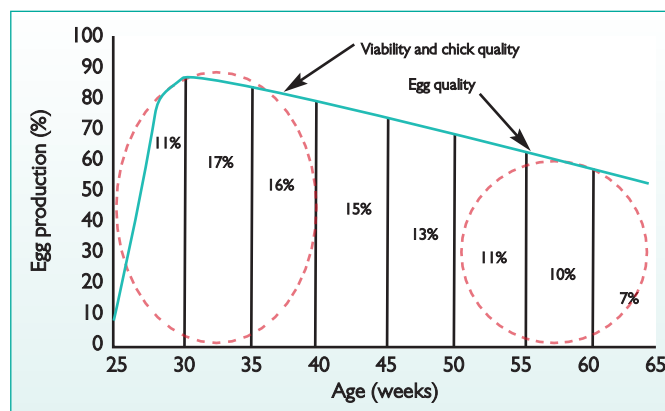


Fig. 2. Important aspects during egg production (%) of broiler breeders (Silva, 2014).

(10.9 MJ/kg) to high (11.7 MJ/kg) (2,600 to 2,800 kcal/kg) AME, and in practise even lower energy contents (10.6 MJ/2530 kcal/kg) have been applied. Feed protein and amino acids have to be adjusted according to the energy content of the diet in order to maintain the optimal dietary energy to protein ratio. Excess protein and amino acid intake will lead to overfleshed birds with low fat reserves which will negatively affect both egg production and its persistency. Recommended dietary protein contents are 14 and 15% and digestible lysine contents 0.52 and 0.61% for diets containing 10.9 and 11.7 MJ/kg, respectively.

In addition, breast muscle size decreased and abdominal fat pad increased.

Good quality fibre rich raw materials are required for low energy diets. If included in the feed in a coarse enough particle size, these raw materials will provide sufficient structure to stimulate gizzard development. This will regulate the flow of nutrients into the small intestine, optimising digestive processes and nutrient utilisation. Low density diets may also promote satiety of the birds by increasing the fill of the gastrointestinal tract.

In all, there are several tools for achieving good uniformity:

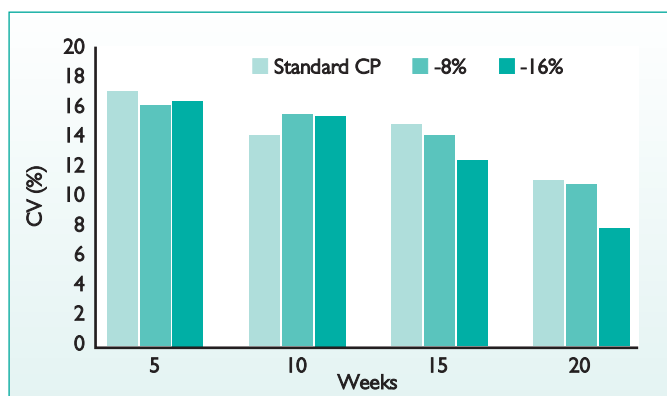
- Simultaneous feed distribution.
- Enough feeder space.
- Feed clean-up time monitoring.
- Scatter feeding in the litter.
- Low energy and protein rearing diets.

## Pre-laying phase

The pre-laying phase is an important stage in preparing the broiler breeder female for sexual maturity and egg production. Between 15 and 22 weeks of age body weight increases by more than 50%. The bird must receive the right feed increments in order to successfully complete this pre-lay growth and to ensure the correct body composition.

Continued on page 9

Fig. 1. Lowering the crude protein content (and amino acids adjusted accordingly) of rearing diets reduced the Coefficient of Variation (CV) % of the breeders (van Emous et al. 2013).



## Uniformity is a must

If the uniformity of a flock is low (high Coefficient of Variation %), the birds will come into lay unevenly and flock reproductive performance will be reduced. Achieving good flock uniformity may be easier with low energy diets because the daily feed portions are larger and feed clean-up time is longer.

Van Emous (2013) showed that lowering the protein and amino acid content of low-energy rearing diets (thus widening their energy to protein ratios from current recommendations) increased the feed intake and improved uniformity at 15 and 20 weeks of age (Fig. 1).



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Continued from page 7

tion and fat reserves for supporting egg production are developed.

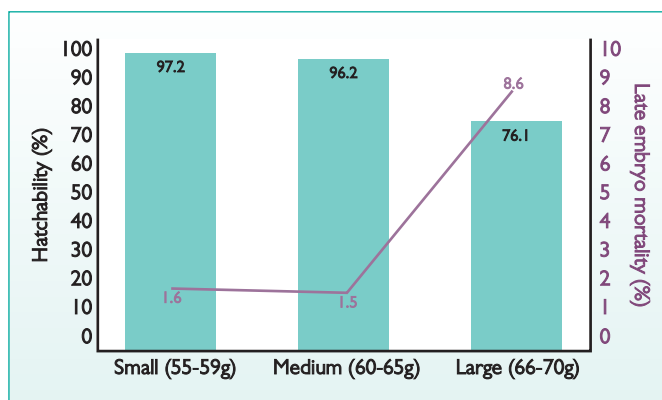
If the energy content of the grower diet has been low (for example 10.9 MJ/kg), a pre-layer diet with a higher energy content is recommended. This will allow a smooth energy transition into the production phase, proper weight gain, breast conformation and fat reserve deposition. In addition, feeding just a low energy grower diet until lay might create a problem because the daily feed allocation should not be reduced prior to peak production. If the energy content of the diets used in rear and in lay is similar, the use of a separate pre-layer diet may not be necessary.

## Production phase

The main target for this period is to maximise the number of fertile hatching eggs. Special attention has to be paid to chick quality during the first weeks of production and to hatchability during late production.

Fig. 2 shows the relative importance of each five week period during production on total egg output.

During production the breeder female needs to get enough nutrients for body maintenance (weight, feathering, and immunological status), growth, egg production and



**Fig. 3. Effect of egg size (small, medium, large) on hatchability and late embryo mortality (Shafey, 2002).**

activity. Between 22 and 30 weeks of age body weight increases by 33% and at the same time egg production jumps from 0 to close to 90%. The daily feed allocation must therefore provide enough energy and protein, essential amino acids, minerals and vitamins, (relative to dietary energy), for the bird at this time.

Peak feed should be given early enough, at 60-70% of hen day egg production, to support the peak of production. Small and constant feed increases should be given from 5% of hen day egg production onwards.

If peak feed is delayed, fat reserves may be totally utilised during peak production. As a consequence, recommended feed reductions later on may have to be smaller or not possible at all, leading to overweight birds and eggs, and impaired persistency of egg production.

In the long term, an energy deficiency early in lay risks not only egg production and persistency but also the immunological and feathering status of the bird.

After peak, less energy and nutrients are needed for egg production, which naturally declines over time. The oversupply of nutrients post-peak will result in increased growth and obesity, leading to reduced egg production.

Lower nutrient allocation post-peak is achieved either by decreasing the daily feed amounts and/or by reducing the nutrient content of the diet. Post-peak feed reduction levels depend on many factors, such as body weight, egg production, egg weight, ambient temperature, feathering status and the health status of the birds. Post-peak it is important that the birds still keep gaining some weight as this helps to maintain the egg laying persistency, fertility and hatchability. Regular weighing of the breeders is important through the whole production period!

At peak, the energy requirement of a breeder is approximately 460-470kcal/bird/day (at an environmental temperature of 21°C) and the expected protein consumption not more than 24-25g per day.

The feeding of a breeder layer one

diet containing 11.7 MJ (2,800kcal) of AME/kg and 15% of protein with balanced amino acid composition allows excellent egg production and good egg size at the beginning of the production period. In order to reduce the risk of overweight birds (with reduced egg production) and increased egg size (with reduced hatchability, Fig. 3) a change to a breeder layer two is recommended with lower protein and amino acid content right after peak production, and by 35 weeks of age at the latest.

The energy recommendation for breeder layer two remains the same as in layer one, which makes the feed change transition easier.

## Vitamins and minerals

Proper dietary vitamin and mineral supplementation in the laying phase is important for promoting good fertility, hatchability and chick quality. Adequate levels of vitamins and minerals are needed for supporting normal embryo development.

Deficiencies may cause embryo mortality, malformation or other abnormalities. Heat treatment of the feeds may reduce the vitamin stability and this must be taken into account when planning the premix composition and inclusion of the diet.

## Coarse mash diet

Physical quality, fibre and energy content of the feed have been shown to influence eating-up time, gizzard function, feather pecking and plumage condition in laying hens.

In a recent Aviagen trial, broiler breeders fed a coarse mash layer diet formulated according to recommendations had better performance than breeders fed a similar diet in crumble form.

Whole cereal inclusion seemed to improve hatchability and chick output but this needs further research to confirm. The gizzard of breeders fed diets containing whole cereals has also been found to be bigger

than the gizzard of breeders fed crumble diets.

## Hatchability

From a nutritional point of view, hatchability can be influenced by both male and female breeders, the nutrients deposited in the egg for the embryo, and the egg shell characteristics.

Overfeeding energy and protein may reduce fertility both in females and males. Poor shell quality may increase the loss of settable eggs and reduce hatch of fertile eggs.

In a recent trial, a low-protein diet (11.3% vs. 14.1%) fed to breeders during rear changed the breeder body composition with positive effects on incubation traits during the first laying phase, and improved egg production during the second phase of lay. Interestingly, a higher energy diet (3,000kcal/kg instead of 2,800kcal/kg) during the second phase of lay showed positive effects on hatchability, embryonic mortality and number of settable eggs.

Replacing some of the trace minerals with organic forms, or vitamin D3 with 25(OH) vitamin D, increasing the dietary vitamin E content and L-carnitine may also improve hatchability, at least in young breeders.

## Separate feed for males


Males may benefit from a separate male diet with lower protein (11-13%) and amino acid contents. A male diet of this composition allows increased daily feed allocations and at the same time prevents excessive breast size development.

Increased breeder male feed allocation during the production period has been proven to improve fertility. Feed additives like organic selenium, L-carnitine, ascorbic acid, and creatine may be beneficial for sperm quality. Male diets are typically formulated with a range of 10.9-11.9 MJ/kg (2600-2850kcal/kg) and should be introduced by 25-26 weeks of age at the latest.


## Conclusions

Controlled growth with well balanced diets, uniformity and optimal carcass composition with the correct fat reserves during rear are the key factors which influence the future reproductive performance of breeder flocks. Careful feeding to peak, and close follow-up to maintain the condition of the birds and implement feed adjustments accordingly during the laying period, help to optimise the performance results of modern broiler breeders. ■

References are available on request from [ehelander@aviagen.com](mailto:ehelander@aviagen.com)



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# Protecting egg quality from the effects of mycotoxins

by Michele Muccio, Mycotoxin Risk Management Product Manager, Biomin Holding GmbH.

Mycotoxin contamination of feed is a known problem that poses a serious risk to birds and costs the poultry industry billions of dollars worldwide. In the US alone, economic losses due to aflatoxin, fumonisins and deoxynivalenol were estimated at around US \$900 million per year. Ducks, turkeys and chickens are all susceptible to the negative effects of mycotoxins, though to different degrees and depending upon a number of factors on the farm. Among metabolites that are of concern for the poultry industry, residues from aflatoxins, ochratoxins and fumonisins have been shown to carry over into animal products such as eggs, tissues and blood.

## Harm to chicken embryos

Toxicity experiments on chick embryos were carried out over recent years for several groups of mycotoxins. Most of the publications focus on three main parameters: toxicity effects, pathological and eventual teratogenic effects. Table 1 summarises the results of scientific studies on mycotoxins that are most relevant to the poultry industry and where the carry over of residues in eggs was demonstrated. The main effects of fusarium

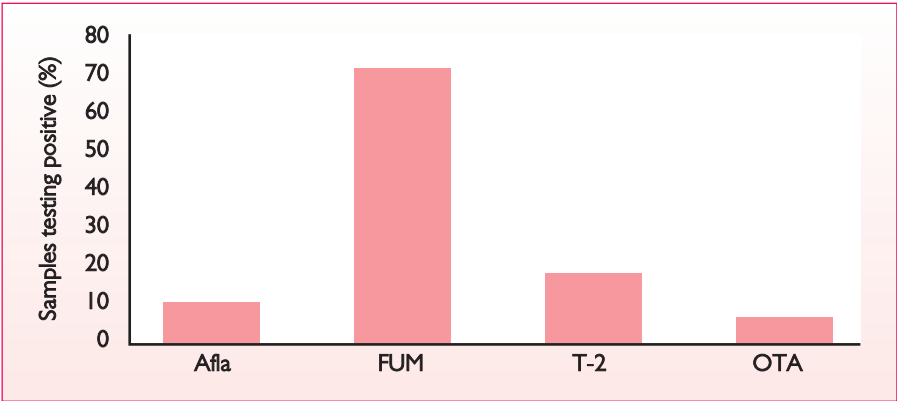


Fig. 1. Positive samples (Biomin Mycotoxin Survey, January to June 2015).

	Afla	T-2	FUM	OTA
Number samples tested	450	335	428	339
Average of positive (µg/kg)	48	86	1,343	2
Maximum (µg/kg)	291	484	16,258	7

Table 2. Biomin Mycotoxin Survey results for corn (2015).

toxins (fumonisins and T-2 toxin), aflatoxin B1 (AFB1) and ochratoxin A (OTA) concentrations are shown in Table 1. All experiments were carried out in ovo under laboratory conditions. Since 2004, the annual Biomin Mycotoxin Survey has tested finished feed and a broad range of feed raw materials including all

major grains, protein sources and by-products. Table 2 shows the latest survey results for corn (maize) regarding occurrence, average concentration, number of samples tested and maximum concentration. For fumonisins and aflatoxins, average concentration levels in

Continued on page 13

Table 1. Summary of relevant mycotoxins' effects on poultry embryos.

Toxin	Concentration (ppb)	Main effects
Fumonisin B1, B2 and B3	40 to 1280ppb/egg	Several organ lesions were observed after microscopic examination at day 10. Fumonisin B1 lethal to half of population after 72 hours incubation at 340ppb.
AFB1 and OTA	5ppb/egg alone, 46ppb/egg in combination	Everted viscera, exencephaly, crossed beak, mortality ranged from 27.5% (one toxin at the lowest concentration) to 37.5% (combination of toxins at the lowest concentration).
T-2 Toxin	250ppb, radio-labelled	0.04% T-2 was found in egg yolk and 0.13% T-2 was found in egg white after 24 hours. T-2 toxin has embryotoxic and teratogenic effects in embryo, inducing malformation and high mortality.





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Continued from page 11

the field matched levels used in the toxicity experiments, which is unexpectedly high.

For OTA and T-2, the average concentration level was considerably lower than the laboratory test: something that is more commonly expected.

## Find one, find many

While a single mycotoxin alone can negatively impact birds and embryos, a decade worth of data indicates that in the field several mycotoxins are often found together. According to the latest results, 60% of corn samples analysed worldwide contain two or more mycotoxins, while another 32% contain at least one.

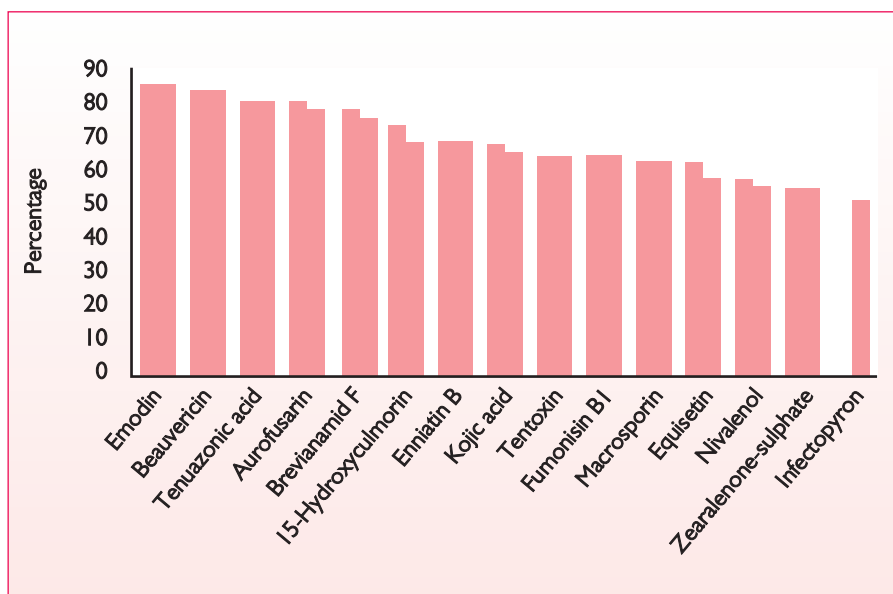
As mycotoxin detection technology becomes more sophisticated, the picture becomes even more crowded.

Using a powerful new tool (Spectrum 380) for the detection of mycotoxins and their metabolites, based on liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS), analysis reveals that 18 different metabolites were found in more than 50% of the samples analysed (Fig. 2).

This co-occurrence of mycotoxins can pose further danger, since a number of mycotoxins have been found to have synergisms, or enhanced negative effects on poultry. For example, the aflatoxin/ochratoxin combination in Table 1 increased the mortality rate by 10 percentage points. This means that even low levels of mycotoxins can interrupt egg production.

## Risk management

The EU registration represents a benchmark for quality and proves the safety and



**Fig. 2. Mycotoxin occurrence using Spectrum 380 for corn samples worldwide. Cut off for each metabolite was 1ppb, except for aflatoxins (0.5ppb).**

effectiveness of feed additives. The adsorption strategy is over 90% effective against aflatoxins.

Biotransformation is the degradation of mycotoxins into non-toxic compounds. In the case of fusarium toxins (trichothecenes including T-2 and fumonisins), degradation is carried out by a patented bacterial strain (Biomin BBSH 797) and a purified enzyme (FUMzyme), directly in the intestinal tract of the animal. Mycofix degrades 100% of fumonisins.

Furthermore, Biomin MTV – non-pathogenic yeast – protects against OTA and ZEN. The bioprotection strategy uses a mix of algae and plant extracts to protect the liver and strengthen the natural immune support, compensating for the adverse effects of mycotoxins.

## Conclusion

Mycotoxins have a strong carcinogenic potential that negatively effects hatchable eggs, inducing mutations in the offspring in some cases. The negative impact of mycotoxins on embryos can be further aggravated by the co-occurrence of different metabolites.

Robust mycotoxin risk management that includes regular detection coupled with the use of an authorised deactivating product will help to ensure overall animal health and performance, egg production and offspring viability. ■

References are available from the author on request

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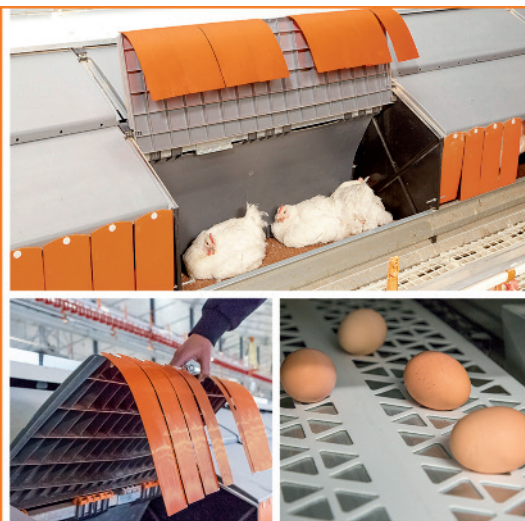
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## New solution to boost hatchery hygiene standards

Maintaining a clean environment within different hatchery boxes can often be a challenge but iD Projects' new range of washers can help hatchery owners achieve better hygiene practices.

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As hatchery automation equipment specialists, they deal with many hatcheries around the world and often encounter and solve even the most complex of challenges.

However, as with all things in life, sometimes it is the simple problems that cause the most difficulties for business owners.

One of these simple problems they regularly hear about from their customers is the issue of maintaining a clean, and therefore hygienic, hatchery environment. This issue is particularly pertinent when it comes to hatchery baskets.

Hatchery baskets often have to hold chicks for several hours before 'take-off' or processing. The result of this holding period is that these baskets can become heavily soiled with dried faeces, along with 'glued' feathers/fluff and shell fragments.

Keeping this area clean is crucial to maintaining a hatchery which is free from damaging pathogens such as omphalitis, salmonella and mycoplasma, and one that does not provide an attractive environment for vermin.

But, despite the gravity of these risks, even hatcheries which employ the most stringent of hygiene methods can struggle. The design of hatchery baskets means cleaning them is more difficult than cleaning chicks boxes or setter trays and in general, more than any other boxes used in the industry.

In response to this problem, iD Projects has developed a new range of washers tailor-made for hatchery requirements. Their new collection of washers have specific settings to handle the whole range of boxes used within hatcheries, including hatchery baskets, setter trays, chicks boxes and trolleys.

Using their technical expertise, this new range of washers offers a unique solution by allowing the tailoring of a washing program to the specific box being cleaned. One of the main features they have included is the variance of speed, crucial for

effective cleaning for example a slower transit through the washing process gives better results on dirtier boxes.

Other features, such as adjustable water pressure, ensure the best results on even the most soiled of hatchery baskets.

By adapting their new range of washers to tackle specific industry challenges, iD Projects is proud to continue to champion hatchery best practice, and to contribute to the overall improvement of hygiene levels within these facilities.

## High capacity counting, vaccination and analysis

Market demand for modular, single stage incubation has increased substantially in recent years, with growing recognition in the poultry industry that a short hatch window and uniform, robust chicks are critical factors for obtaining the best performance.

[www.pasreform.com](http://www.pasreform.com)

The impact of effective single-stage incubation strategies, expressed in terms of hatchability, growth rate and feed conversion ratios, is felt throughout the poultry value chain.

To keep pace with growing demand for high quality chicks, hatcheries large enough to produce more than two million day old chicks per week are no longer unusual.

These growing hatcheries have become highly automated, to handle chicks in such large numbers. This promotes short 'throughput time' – another key measure of chick quality for its influence on post hatch performance. The case for automation is further strengthened by the growing cost and reduced availability of qualified labour.

At the core of these transitions in the poultry industry, lies a duty of care to the retailer and ultimately to the consumer, to deliver the highest standards of animal welfare and offer complete traceability, from egg production and hatchery all the way down the chain. Together, these factors create increasing demand for innovation, to support and improve standards of animal welfare – and to increase the availability of information from source.

In response, Pas Reform Academy has looked for more intelligent, innovative ways to handle valuable, day old chicks, with minimum impact on their health and well-being, while at the same time reducing their throughput time.

This focus has placed Vision Technology at the heart of a new system for chick counting and quality analysis, to produce significant increases in efficiency, chick uniformity and standards of animal welfare. Pas Reform has named this latest innovation SmartCount.

SmartCount applies Vision Technology – a complex pairing of digital imaging and pre-defined algorithms, to count and analyse groups of day old chicks.

Image sequences are interpreted using these criteria, pre-set by Pas Reform Academy, to process the chicks in stress-free conditions.

With an accuracy of two chicks per thousand, SmartCount's nett system capacity is 60,000 chicks per hour.

The same level of intelligence and accuracy defines a range of key parameters, including smart pattern recognition for even, gentle distribution in the right numbers into the chick boxes at the end of the conveyor and precise, optimised spray vaccination.

SmartCount's chick analysis system incorporates calculations for uniformity scoring – and by integrating SmartCount statistics with SmartCenter hatchery information system data, the hatchery is equipped with the most detailed level of data analysis and batch reporting available today.





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### Egg processing equipment for a range of avian species

National Poultry Equipment (NPE), located in Osage, Iowa is a privately held manufacturer of egg processing equipment for small and medium sized egg producers.

[www.nationalpoultryequipment.com](http://www.nationalpoultryequipment.com)

NPE's egg processing equipment is distributed globally and can accommodate eggs from nearly all avian species and serves multiple market segments including table egg producers, Specific Pathogen Free (SPF) egg producers, and various avian breeding operations.

Manufactured under the brand name Sani-Touch, NPE manufactures machines that candle, sanitise,

TT (Table Top) unit that can wash as many as 1,000 eggs per hour. The table top unit shares the same characteristics as the larger machines but on a smaller scale and a more affordable price which helps to better serve the free range and cage free markets with smaller flock sizes.

The Sani-Touch Grader comes equipped with a Digital Egg Weigh System that offers fast, accurate egg weighing and sorting to  $\pm 0.5g$ .

Graders previously manufactured by NPE with mechanical scale systems can easily be upgraded to the new digital scale system. In addition, graders can come equipped with the optional Vak Pak System that aligns eggs to be picked up 6, 12, 18, or 30 at a time with a vacuum lift system.



**The new Sani-Touch table top unit.**

and grades eggs. The machines make use of a single line and use only fresh water to sanitise eggs. NPE offers machines that perform all three functions (candle, sanitise, and grade) or separate units that may offer just one or two functions. The machines can operate stand alone or combined with other egg handling equipment.

Historically, NPE has offered three different sanitisers that can process as many as 8,640 eggs per hour with the Sani-Touch Model 20, 5,400 eggs per hour with the Model 10, or 2,520 eggs per hour with the Model 5. In the past 12 months, NPE began manufacturing the Sani-Touch Model

NPE manufactures additional equipment including Cross Loaders and the Sani-Touch Tray Pack. The Cross Loaders are used to transfer eggs automatically onto the candling unit, whereas the Tray Pack is a separate machine used to align eggs, which do not need to be graded, for packing trays with a vacuum lift system. NPE continues to serve customers by providing phone support and replacement parts on machines placed into service as early as the 1960s.

Quality and customer service is something that NPE takes pride in and looks forward to serving customers for years to come.



### Cost effective hatchery automation solutions

With the increasing world population the demand for eggs and chicken meat is continuously increasing. To provide a cost effective answer to these needs, hatcheries are increasing in size and with it the need to automate the work to be done in the various sectors of the hatchery (egg reception room; egg transfer room; chick handling room).

[www.kuhlcorp.com](http://www.kuhlcorp.com)  
[www.triplelima.com](http://www.triplelima.com)

Automation usually requires a level of investment that has to be carefully calculated in order to provide the targeted Return On Investment. Too much automation or too little automation will negatively affect the ROI.

Kuhl Corp delivers a wide range of equipment with different capacities and designs that can match your specific needs.

Kuhl offer egg candling and transfer tables, chick shell separators or take off units, sexing and vaccinating carousels, chick counters, chick spray vaccination units as well as equipment designed to handle and store waste.

Automatic unstacking, conveying and stacking of the trays and boxes is also available.

To complement the range of hatchery automation systems Kuhl offers a complete line of washers. These washers can operate stand alone or integrated with some of the hatchery automation systems and help you achieve and keep the hygienic levels requested for an optimal performance and profitability of your hatcheries.

With the Kuhl washers you can wash hatching eggs, plastic egg trays and egg boxes, transport and setter trolleys, setter and hatching trays as well as chick boxes. The Kuhl units are compact, very energy and water efficient, and simple and easy to operate and service.



# Options for

## The worry-free approach to hatchery automation

Jamesway, international manufacturer and supplier of poultry incubation systems and accessories, based in Cambridge, Ontario, has considerable experience in automating hatcheries throughout the world.

[www.jamesway.com](http://www.jamesway.com)

From the US to China, Russia to the Middle East, some of the world's largest hatcheries are running in a highly automated manner thanks to Jamesway's worry-free integrated approach to automation.

Whether complex robotic-based automation or small-scale basic automation – or somewhere in between – Jamesway has sized hatcheries for all options and has experience working with many

**A robotic arm (Courtesy of KL Products).**



automation suppliers in various regions.

They sell automation equipment in partnership with companies such as KL to provide solutions to companies worldwide.

They work with the automation company of a hatchery's choice to ensure that the hatchery design works for both their Jamesway equipment and the selected automation equipment.

Their objective is to ensure that a hatchery's vision for an integrated, automated hatchery is completely fulfilled in practice.

To do this, Jamesway's sales and technical representatives work together with automation suppliers and hatchery management to size the automation to match the hatchery's needs. If the hatchery does not have an automation supplier, Jamesway can directly contact one on behalf of the hatchery, and ship the automation equipment with the incubators and hatchers.

Items of automation that Jamesway regularly integrates into projects include tray washers, rack washers, egg transfer/candling machines, hatcher basket stackers/destackers, sexing carousels, chick counters, plus all the conveyors and connectors between these items.

Jamesway works through a global network of agents, distributors, and technical representatives to assist customers worldwide in effectively managing their hatcheries.



## New generation packer offers full egg control

Prinzen have introduced their new generation of packer for hatching eggs: the Ovovet Pro. The machine offers an effective operating capacity of 30,000 eggs per hour, depending on setter tray.

[www.vencomaticgroup.com](http://www.vencomaticgroup.com)

The introduction of the Ovovet Pro answers the high capacity need of larger breeder farms as well as hatcheries. The Ovovet Pro makes a perfect match with the earlier introduced Ovograder.

The various possible machine configurations all offer clear overview, full egg control and an ergonomic workplace for staff. The smart touch screen control panel increases user friendliness and provides operational information. Just like all the egg handling equipment from Prinzen, the

machine is made from robust and durable materials. Special attention is given to specific mechanical and electronic parts to enhance the daily operation and make it extra suitable for hatcheries. Vital parts are easily accessible for cleaning, service and maintenance.

Optional to the Ovovet Pro is the PS4 tray stacker, used when handling 30-cell trays, egg coding and egg inspection equipment. Tray conveyor belting and curves offer a compact machine configuration that fits in every farm house egg collection room. Even further automation is possible with automatic loading of setter trays in farm or setter trolleys for transport to the hatchery.

The PSCP series will remain available for medium sized farms, offering a value for money machine for selecting and setting hatching eggs.

## Reducing the bacterial load in the hatchery

Increasing demand for high quality poultry produced with a minimum need for antibiotics has become a major issue.

[www.innovatec.com](http://www.innovatec.com)

Innovatec's focus on product innovation is not a goal in itself, but the result of ongoing improvements aimed at meeting the new standards.

The introduction of CLEANchick by Innovatec has certainly triggered the interest of the poultry industry. Several leading hatcheries in Europe

have already decided to increase biosecurity, achieve the best chick quality and reduce antibiotics by choosing to use CLEANchick and others have expressed their intention to use it.

CLEANchick detects living embryos. This makes it possible to remove contaminated eggs (gaseous eggs/exploders), dead in shell and clear eggs.

The removal of contaminated eggs eliminates exploders during the last three days of the incubation process. As a result, the chicks are visually

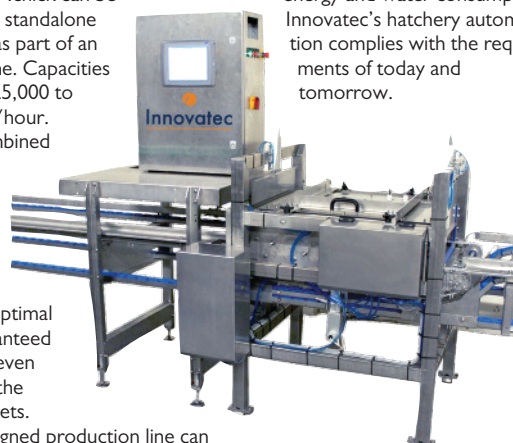
drier and cleaner. Another important advantage is the reduced need for antibiotics.

The CLEANchick can be supplied as a standalone machine or as part of an integrated line. Capacities range from 25,000 to 90,000 eggs/hour.

When combined with the Automatic Backfilling unit, efficiency will be further increased. Optimal filling is guaranteed and a more even heat load in the hatcher baskets.

A well designed production line can

have a great impact on the hatchery results, such as increased biosecurity, improved productivity and reduced energy and water consumption. Innovatec's hatchery automation complies with the requirements of today and tomorrow.





## New developments in automation

Nowadays a certain level of automation is common in a modern hatchery. It reduces labour costs and improves biosecurity and animal welfare. In general it has made the day to day task of a hatchery manager more convenient.

[www.visconhatcheryautomation.com](http://www.visconhatcheryautomation.com)

Looking to the future, Viscon sees the function of hatchery automation broaden more. Disease control and field performance are challenges where hatchery automation will play an important role. By applying intelligent solutions that further improve hygiene throughout the complete incubation process, health problems and use of antibiotics can be reduced. Safe and accurate vaccine delivery in the hatchery will strongly contribute to avoiding losses in the field. This, together with overall data management and traceability of the production process, will give the hatchery manager of tomorrow the right tools for this challenging task.

The Vinovo Select Line is already a strong answer to this challenge. Since its introduction last year, it has gained positive results in successful in-ovo vaccination and has been installed within prominent hatcheries worldwide. It improves the in-ovo vaccination and transfer procedure by accurate detection of living embryos (Live Embryo Detection) and reverses the sequence of egg processing.

First, only the viable eggs are vaccinated and transferred to the hatchery baskets. The non-viable eggs remain untouched in the setter tray for processing in a separate waste room.

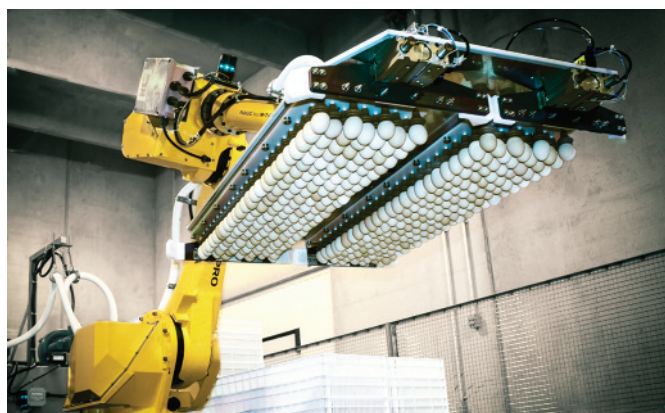
This revolutionary change in procedure, and the fact that dead embryos and 'bangers' are excluded from the remaining production process, creates a more hygienic and safer environment during transfer, hatching and processing of chicks.

The same technology is applied in the recently developed automation line for HatchCare facilities.

Only living eggs are transferred to the HatchCare trays and will enter the HatchCare hatchers. The HatchCare automation line also includes a revolutionary way of chick processing. No separators or chick counters are used anymore. With the new system, the number of unhatched eggs is counted, instead of the number of hatched chicks. Chicks remain in their hatching crates until their arrival at the poultry house. This creates a stress-free environment for optimal chick welfare. Viscon supplies a full range of equipment, from egg reception to chick delivery, adapted to any brand of incubation system, suitable for broiler, layer and breeder hatcheries.

Their delivery scope for hatchery automation includes:

- Egg re-packing, handling and sorting systems.
- Egg candling and transferring systems.
- Live Embryo Detection.
- Vinovo in-ovo vaccination systems.
- Chick separation, processing and counting systems.
- Washing and drying installations.
- Waste handling systems.
- Product storage systems.
- Data management.



## Automation solutions advance hatchery efficiency

In the highly integrated global poultry industry, hatcheries are seeking ways to provide healthy, immunised chicks, while increasing operational efficiencies. To provide customers with full automation solutions for their hatchery operations, Zoetis has acquired KL Products Inc – a leading manufacturer of automation systems for the poultry industry.

[www.zoetisus.com/automation](http://www.zoetisus.com/automation)

The KL hatchery automation portfolio products deliver state-of-the-art automation including robotics, while complementing the category-leading Embrex in ovo vaccine delivery systems from Zoetis.

As poultry producers around the world build larger, more modern hatcheries to meet the increasing needs of a growing world population, the need for faster, more efficient equipment has grown too. With the acquisition of KL, Zoetis now has the automation solutions to support customers' business needs.

Similar to Embrex BioDevices pioneering the in ovo vaccination process more than 20 years ago, KL was the first to introduce robotics in the hatchery. The KL automation product line was developed to meet the new structure of high-volume hatcheries. Today's automated hatcheries have 10 times the capacity of their predecessors.

In addition to robotics for handling eggs, baskets and boxes, the KL automation portfolio comprises everything required to fully automate a modern hatchery, including stacking equipment, chick and shell separators, and hatchery washing and sanitising equipment. The development of hatchery automation

technologies that are complementary to each other, and to Embrex BioDevices, helps maximise hatchery efficiency and throughput. These products allow for more effective hatcheries by automating laborious tasks and processing chicks more quickly for transfer into grow-out facilities.

The KL hatchery automation line is backed by a global network of service personnel from Zoetis who provide dedicated customer assistance as well as automation device customisation, manufacture, testing and installation. Zoetis provides preventative, in-house maintenance services to help minimise downtime and keep hatcheries running consistently. Featuring high throughput and ease of sanitation, cleaning and maintenance, the KL product line is built for longevity and resistance to the harsh hatchery environment. Most devices can be networked for ease of diagnostics, service repairs and upgrades via modem.

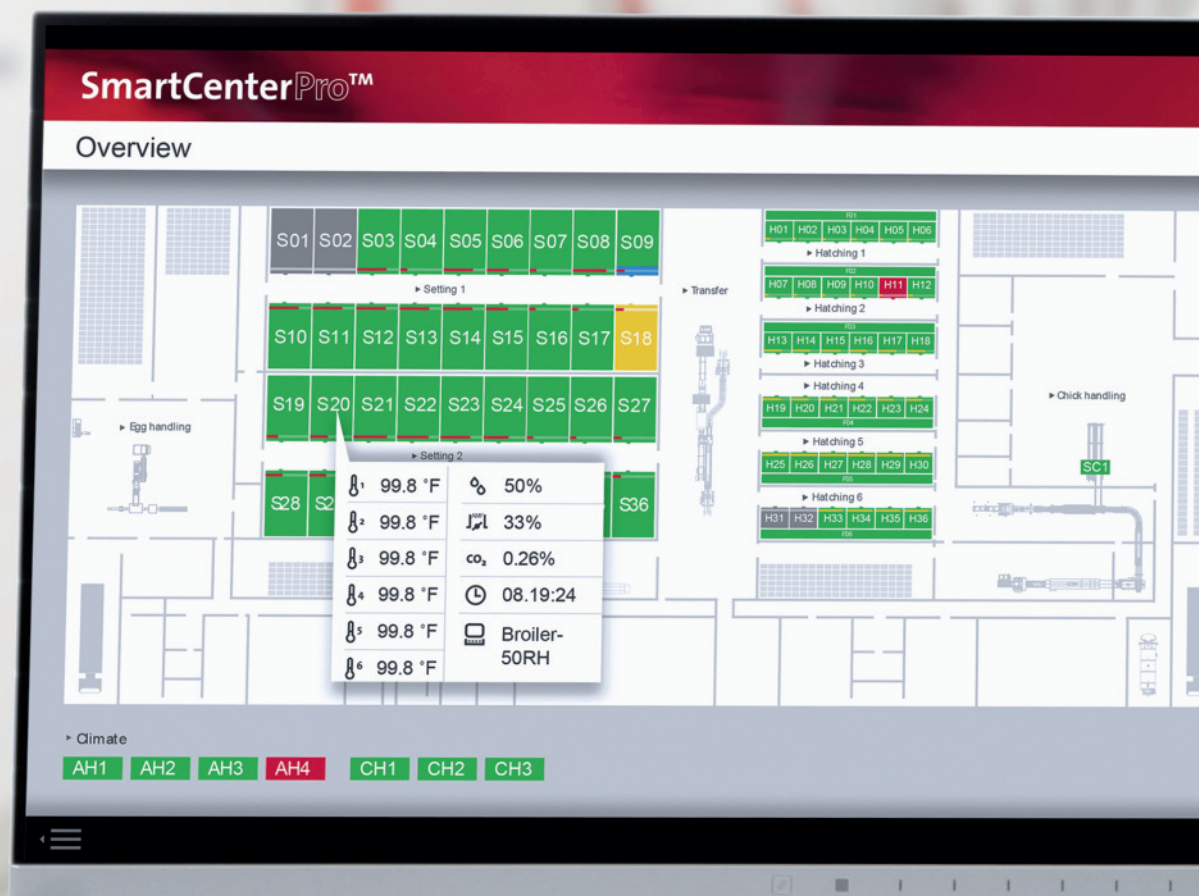
It takes new and innovative solutions to keep hatcheries strong and competitive, and Zoetis is committed to developing products and services that meet the needs of today's hatcheries.





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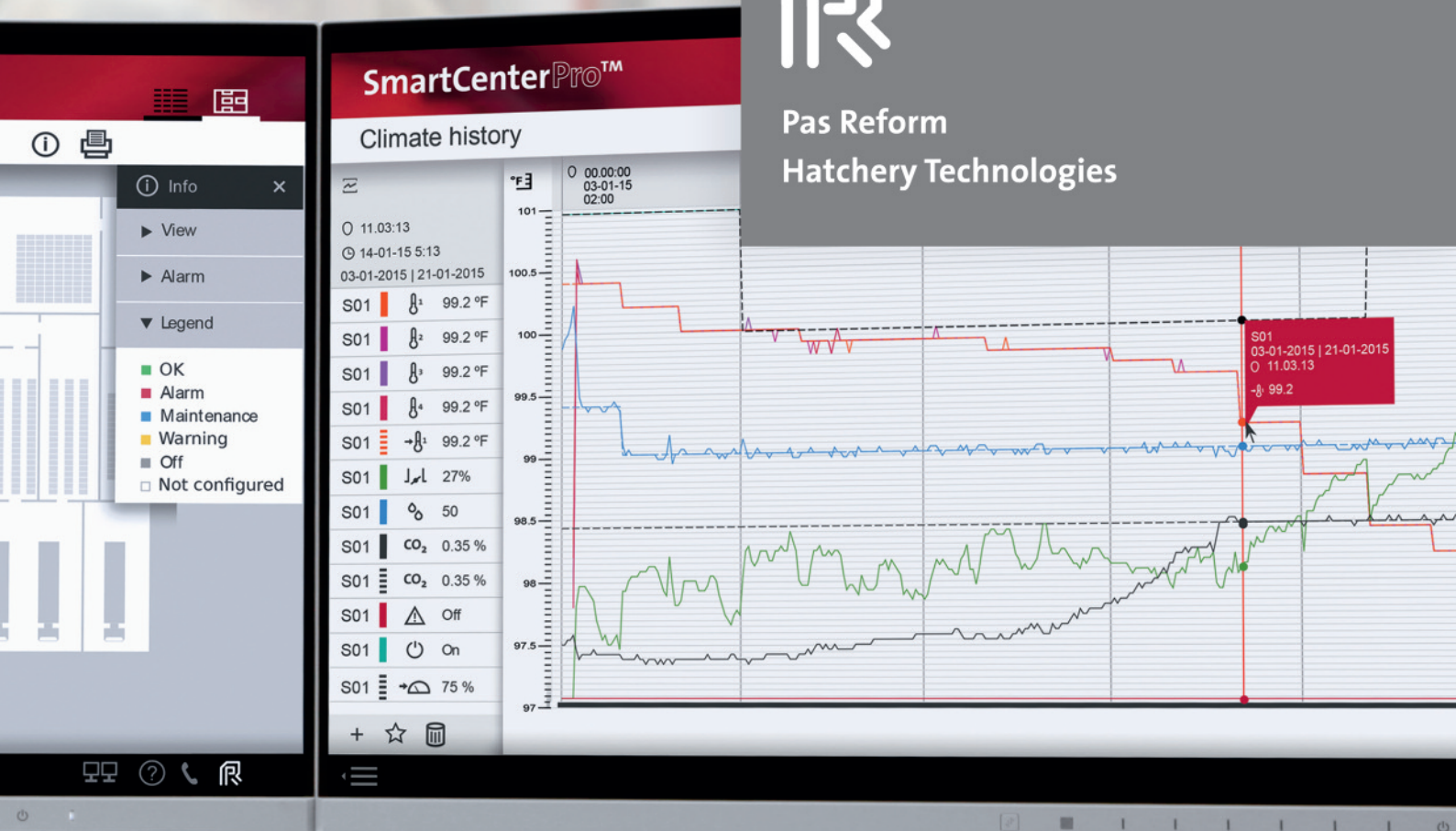




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## Poultry Focus Asia 2016

### DAY 1

9:30	Opening Ceremony	
9:45	Animal performance improvement thanks to algae	Pi Nyvall Collen, Olmix
10:15	Genetic improvements for efficient production	Neil O'Sullivan, Hy-Line
10:45	Antibiotics: An essential tool in livestock production	Alain Kanora, Huvepharma
11:15	Cost Effective Veterinary Inputs	Zoilo Lapus
11:45	Lunch	
1:00	Reducing pre-harvest pathogens	Jiraphat Thamrongchawalit, Diamond V
1:30	Gut health: A continuously challenged eco-system	Stephan Bauwens, Innovad
2:00	Maintaining gut health for better performance	Randy L Payawal, Biomin
2:30	Optimising intestinal health with butyrate	Valentine van Hamme, Impextraco
3:00	Break	
3:30	Broiler breeder mortality	Luis Vera Kellet, Aviagen
4:00	Beyond in-feed antibiotics – proven alternatives; added benefits	Ajay Awati, Danisco Animal Nutrition
4:30	Getting best results from modern breeders	Alvin Arucan, Cobb Vantress

### DAY 2

9:00	Updates in Marek's disease control	Stephane Lemiére, Merial
9:30	Practical mycoplasma control for Asia	Chris Morrow, Bioproperties
10:00	Break	
10:30	Efficient avian pathogenic E. coli management	James Yong-Seok Kim, Zoetis
11:00	Preventing antibiotic resistance	Anant Deshpande, Addcon
11:30	2015 bacterial enteritis global impact assessment results	Aurelio G Tayao, Elanco Animal Health
12:00	Lunch	
1:00	Market developments in the EU on differentiated production	Paul van Boekholt, Hubbard
1:30	On-farm hatching affects broiler health	Peter Schreurs, Vencomatic
2:00	Nutritional disease management of farmed poultry	Klaus Hoffmann, Chemoforma
2:30	Genomic selection for adaptability	Thierry Burlot, Novogen
3:00	Break	
3:30	Brooding management	Tin Phung, Hy-Line
4:00	Dual-Pressure: New in-ovo technology	Carlos Gonzalez, Ceva Animal Health
4:30	Genetic improvement in layers for egg production and quality	Julien Fablet, ISA BV, Hendrix-Genetics
5:00	Breeding Pekin ducks for meat production	Hans-Heinrich Thiele, Orvia

### DAY 3

9:00	Global trends in coccidiosis control	Koen de Gussem, Huvepharma
9:30	The why and how of antibiotic free production	Tugrul Durali, Alltech
10:00	Break	
10:30	Phytonutrient technologies for improving health and performance	Clémentine Oguey, Pancosma
11:00	Examination for enteric pathogenic bacteria in chickens	Gál János, Dr Bata
11:30	Insoluble fibre - the forgotten nutrient in poultry nutrition	Manfred Pietsch, JRS
12:00	Lunch	
1:00	Innovative plant extracts for poultry nutrition	Monika Korzekwa, Dr Eckel GmbH
1:30	New enzyme concepts for broiler nutrition	Erik Vanderbeke, Aveve Biochem
2:00	New generation of organic selenium	Marc Rovers, Orffa Additives BV
2:30	Bioavailability of zinc sources	David Mathé, Animine
3:00	Break	
3:30	Intestinal development in chicks	Andres Ortiz, Novation
4:00	Valuable interventions for mycoplasma and ORT disease	Khaled Hussein, Eco Animal Health Ltd
4:30	Genetic and environmental effects on egg shell stability	Ron Eek, Lohmann Tierzucht

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# New research in spray cabinet application for optimal IB control

by Rik Koopman, DVM, Global Technical Director Poultry, MSD Animal Health.

Infectious bronchitis (IB), a highly contagious upper respiratory tract disease of chickens, can result in major economic losses for producers.

IB infection causes poor growth and performance, decreased egg production, and predisposition to secondary infections, which leads to air sacculitis and condemnation at the processing plant.

The speed and frequency at which the disease evolves and spreads, as well as the presence of more than a dozen different serotypes and hundreds of variants of the virus, makes IB protection a significant challenge for the poultry industry.

A critical component of maximising IB protection is starting the vaccination process in the hatchery rather than the broiler house. By doing so, chicks are protected earlier and are exposed to a more efficient, precise vaccination process.

Spray vaccination offers mass application via multiple routes of rapid exposure to the vaccine, including intraocular (eye drop), intranasal and oral application.

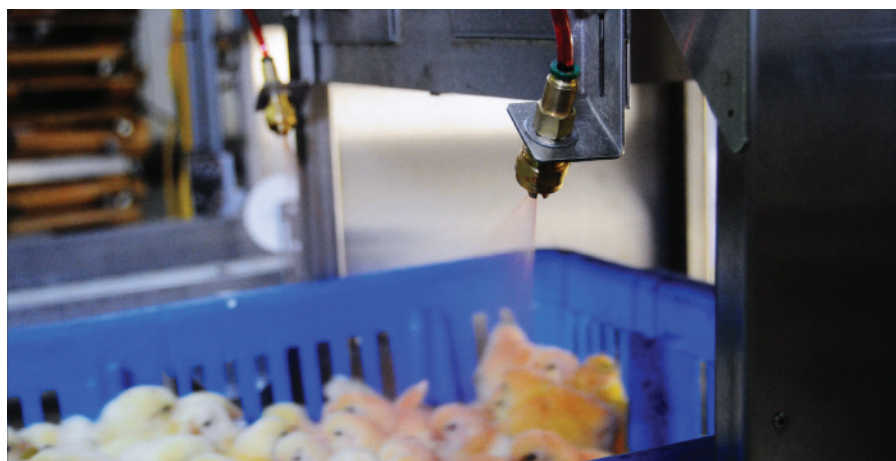
Care must be taken to ensure that the spray pattern provides vaccine coverage of the entire chick basket, so that droplets reach all routes of vaccine uptake – the eyes, the nares and the feathers.

## Factors affecting efficiency

Dr Brian Jordan of the Poultry Diagnostic and Research Center, University of Georgia, Athens, GA, reviewed the state of spray cabinet vaccination in hatcheries today in, 'Spray Cabinet Application of Infectious Bronchitis Virus Vaccines in the Hatchery: How Efficient Are We?'

"While spray vaccination seems simple, all system components – syringes, nozzles, tubes and connections – must be frequently evaluated to avoid leaks, corrosion and malfunction, and ensure proper vaccination," said Dr Jordan.

The efficiency of vaccine application is influenced by line speed, pressure, flow rate, the number of nozzles and vaccine



application volume. Unfortunately, as producers troubleshoot these factors to process more chicks in less time, many hatcheries may not be vaccinating their chicks properly and efficiently.

### ● Adjusting nozzles to increase or decrease vaccination speed

To vaccinate effectively, the chicks must move through the spray cabinet at a rate so that the correct number of doses from the syringe are expelled through the nozzle. Also, the spray must be timed to the chick basket moving under the nozzles.

Air pressure and nozzle flow rate must be adjusted to match the speed at which many hatcheries operate and accommodate the application volume used.

However, the adjusted pressures, flow rates, and application volumes can also increase shearing forces that destroy virus particles or increase the aerosolisation of the vaccine, making finer droplets that blow out of the cabinet without reaching the chicks.

"In fact, research shows that 50% or more of vaccine volume applied never reaches the level of the chick," Dr Jordan added.

Furthermore, increasing nozzle pressure to match line speed can overshoot vaccine, decreasing the amount reaching the chicks.

Conversely, decreasing nozzle pressure and flow rate to match a slower line speed decreases the spray angle, meaning chicks on the side of the basket may not receive vaccine coverage.

### ● Adjusting nozzles and syringes to apply greater vaccine volume

To increase efficiency, many hatcheries apply IBV vaccine in larger volumes by adjusting the nozzle to increase flow rate or adding more syringes and nozzles to the cabinet.

Adjusting the nozzle to increase volume can have an added benefit of producing larger, heavier droplets of vaccine, making it easier for them to 'fall' down to the chicks. Larger droplets also prevent the chicks from inhaling the vaccine too deeply, keeping it in the upper respiratory tract where the IB pathogen is active. However, this approach results in excessive wetting and over-cooling of the chicks, increasing first week mortality.

### ● Damage to live vaccine virus may go unnoticed

Spray cabinet syringes can be displaced, leak, or draw in more air than vaccine, and they are designed and specified for a single use, not the hundreds or thousands of times they are used in a hatchery. Syringes also account for significant vaccine destruction.

Research shows the differential pressures and shearing forces applied to the vaccines when forced in and out of the syringe is more than enough to kill structurally labile viruses, like IBV.

Additionally, though cost effective, brass nozzles can corrode easily and kill vaccine virus without disrupting spray patterns – causing a failure undetectable without laboratory virology work.

*Continued on page 24*

Continued from page 23

"Thus, there are multiple places in a system that can destroy live vaccine and reduce its efficacy, even while it appears to be running properly," noted Dr Jordan.

#### ● Choosing an IBV vaccine to maximise IB protection

While many parameters that affect mass spray vaccination can be adjusted, the choice of IBV vaccine should also be considered. Research shows that a combination of two vaccines such as MSD Animal Health's Nobilis IB Ma5 and IB 4/91 – the Protectotype concept – provides broader spectrum IB protection. When a bird receives two IB vaccines, cross-protection against multiple heterologous IB serotypes along with full protection against the two IB vaccine serotypes is achieved. Critical when a novel serotype or variant arises for which there is no vaccine available, cross protection helps promote healthier flocks with decreased morbidity from IB infection, which helps maintain daily weight gain and feed conversion performance.

#### Mass spray vaccination

Training for proper spray cabinet usage and ongoing monitoring and inspection are necessary to ensure effective and efficient vaccination.

Through its Convenience Program, a full-spectrum respiratory health and immunity program that also focuses on process and performance improvement, MSD Animal Health helps hatcheries optimise their spray vaccination processes.

Designed to increase the convenience, efficiency and accuracy of vaccine administration in the hatchery, the program includes an evaluation to assess spray vaccine solution preparation and the vaccination process, and provides input on spray cabinet maintenance.

To optimise speed, safety and vaccine uptake while minimising waste, the program seeks to standardise spray cabinet sanitation, calibration and operation, and other methods of vaccine delivery, such as Marek's vaccination.

#### A new partnership

To further advance vaccination, the University of Georgia partnered with MSD Animal Health to redesign spray cabinet technology. Dr Jordan presented the resulting innovation, which is expected to reach the market soon, at the American Association of Avian Pathologists (AAAP) meeting in Boston, MA in July, 2015.

The new spray cabinet is designed to provide better vaccination through reduced destruction of virus.

This is achieved through constant pressure application.

#### Constant pressure system

"Pressure differentials and turbulence in the spray cabinet's syringes cause destruction of live vaccines. In contrast, a constant pressure system allows the user to pressurise the vaccine rather than the syringes, eliminating the need for syringes completely," Dr Jordan explained.

The user can also set correct specifications for pressure and optimised nozzle flow rate, making application volumes more standardised by being flexible but directly related to the other specifications.

By reducing the amount of viruses being destroyed, the redesigned spray cabinet will increase the amount of vaccine that poultry are exposed to, increasing their immunity against IB. With the constant emergence of different bronchitis serotypes and hundreds of variants of the virus, IB protection represents a significant challenge for the poultry industry.

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# Superior chick quality is the result of optimal incubation conditions

by Dr Inge van Roovert-Reijrink and Carla van der Pol, Hatchtech BV, The Netherlands.

Delivering perfect day-old chicks is a hatchery's key aim. Chick quality is expressed in various ways, like the number of second grades, hatchling yolk free body mass, chick length, navel quality, and first week growth and mortality.

During the incubation process, eggshell temperature, carbon dioxide concentration, and the post hatch environment are the most important drivers of embryo development. These drivers are directly related to chick quality and subsequent performance. In this article, all of these factors are discussed as well as how they depend on incubator design.

## Eggshell temperatures

Several studies aimed to determine the optimal eggshell temperature (EST).

- Lourens et al. (2005) showed that an EST lower than 37.8°C (100°F) during the first week of incubation or higher than 37.8°C during the third week of incubation resulted in a higher percentage of second grade chickens (up to 5% more) and shorter chick length (up to 5mm smaller).

- Molenaar et al. (2011) showed that an EST of 38.9°C from day seven of incubation



onwards increased the incidence of ascites in later life in comparison to an EST of 37.8°C.

EST in the hatcher phase also has a large impact on chick quality.

- Maatjens et al. (2014) applied three ESTs from day 19 of incubation onward and found higher relative heart weights at hatch for 36.7 and 37.8°C than for 38.9°C (0.69% and 0.66% vs. 0.58%, respectively).

These results suggest that it may be even better to incubate at a temperature slightly below 37.8°C than above it; yolk free body mass of the 36.7°C incubated chicks was 0.65g higher at hatch than that of 38.9°C incubated chicks.

All these studies show the relevance of an optimal EST during incubation to obtain superior chick quality.

## Incubator design

EST is influenced by embryonic heat production and heat transfer capacity of the air, which depends on air temperature, air velocity, and relative humidity. All of these are greatly dependent on incubator design.

The machine needs to have enough heating and cooling capacity to maintain the right temperature. Air velocity should be uniform, to reduce variation in heat transfer capacity and, thereby, ESTs. Thanks to the laminar airflow concept, the air velocity in HatchTech's incubators is perfectly uniform.

Relative humidity affects the air's heat transfer capacity because humid air transfers heat better than dry air.

To maintain optimal ESTs throughout incubation, it would be ideal to maintain a high relative humidity during the whole incubation process.

However, this is impossible because an egg needs to lose 12% of its weight at day 18 of incubation to maximise hatchability. Therefore, the balance between heat transfer capacity created by relative humidity and egg weight loss control is essential. The laminar airflow concept and HatchTech's humidity control guarantee this balance. To obtain superior chick quality

*Continued on page 26*



Continued from page 25

ESTs should always be close to 37.8°C or below 37.8°C after day 19 of incubation.

## CO<sub>2</sub> concentrations

CO<sub>2</sub> concentrations become crucial during the hatching phase. In practice, some hatchery managers try to reduce the hatch window by reducing the inlet of fresh air into the hatcher, increasing CO<sub>2</sub> concentrations in the hatcher above 0.8%. This triggers the embryo to hatch earlier than if the maximum CO<sub>2</sub> concentration is below 0.35%. However, Maatjens et al. (2014) found lower navel quality at 12 hours post hatch for chicks exposed to 1.0% CO<sub>2</sub> from day 19 of incubation onward compared to chicks exposed to 0.2% CO<sub>2</sub>.

This emphasises the importance of maintaining CO<sub>2</sub> concentrations at a lower level to guarantee superior chick quality.

A combination of high EST and a high CO<sub>2</sub> concentration during the hatching process is even more detrimental for chick quality. In some commercial incubators, the cooling capacity of the incubator partly depends on the inlet of fresh air.

Reducing ventilation rate to increase the CO<sub>2</sub> concentration then also results in too high ESTs. The combination of high EST and a high CO<sub>2</sub> concentration during the hatching negatively affects stomach



development. High ESTs and increased CO<sub>2</sub> concentrations should never be used to shorten the hatch window. The reduction of the hatch window will never counterbalance the negative effect on chick quality.

## Post hatch environment

From the moment of hatch until delivery at the farm, rectal temperatures of chickens have to be maintained between 40.0 and 40.6°C.

At temperatures higher than 41.0°C, chickens start panting to cool their body by evaporation. Panting can result in dehydrated chickens when they have no access to feed and water.

Overheating post hatch has a major effect on subsequent growth performance and

mortality. The design of hatchers, chick handling rooms, chick storage rooms, and trucks is, therefore, crucial in achieving the correct environment for every single chicken from hatch until delivery at the farm.

Providing chicks with early access to feed and water not only prevents dehydration. It also allows the chicks to continue their development and use the valuable residual yolk nutrients for immunity and maturation.

Traditionally, chicks spend up to 48 (or, in cases of long travel or an overnight stay at the hatchery, 72) hours without access to feed and water. With HatchCare – the hatcher with light, feed and water, chicks continue to be fed and hydrated until delivery at the farm. This results in heavier, better developed and superior day-old chicks.

## Conclusions

Providing maximum chick quality is largely dependent on incubator design. An incubator should provide the right circumstances for optimal, uniform ESTs, allow embryonic respiration, and continue post hatch development by early feeding and maintaining correct body temperatures. ■

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## Short-term temperature training in the hatcher

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An alternative approach to improve functional traits alongside the production efficiency of fast growing broiler chicken lines provides temperature training in the hatcher (PTT: perinatal temperature training from day 18 until hatching) with short-term mild warm loads.

Temperature training of the developing thermoregulatory system during critical periods has long lasting effects on thermal adaptability and various body functions, because of the strong relationship between the central control of body temperature and body functions, like metabolism, feed intake and body weight regulation as well as immune and stress response.

The hypothesis is that perinatal temperature training improves robustness via long-lasting reduction of the basic metabolism. In previous experiments we found, especially in male chickens, a lower hypothalamic neuropeptide-Y (NPY) expression as long lasting effect on basic metabolism after PTT.

Hence, robust chickens have more energy available for adaptation, immune and stress responses during environmental challenges.

In two pilot studies (summer 2012 and spring 2013) the influence of short-term perinatal temperature training on stress level and welfare in broiler chickens (Ross 308) was investigated.

Eggs were incubated under commercial conditions using incubators with total capacity of 115,200 eggs (SmartSet, Pas Reform Hatchery Technologies, Zeddam, NL).

The eggs were incubated under standard single stage incubation programme (control) or with PTT in the hatcher (+1°C, maximum two hours per day).

Random sampling (120 males and 120 females) of hatched chickens

from control and PTT group was used for subsequent broiler growth trial of 35 days in the experimental research station of the FLI (Federal Research Institute for Animal Health, Institute for Animal Welfare and Husbandry in Celle, Germany).

During the growing period locomotor activity was observed.

On day 34 fear response was examined using a novel object test (NOT).

Blood samples for hormone analysis (T3/4, cortisol, corticosterone) and preparation of blood smears for calculation of heterophile to lymphocyte ratio (HLR) were collected. Locomotor activity was not different between the groups.

However, it must be pointed out that the chickens in the PTT group have a higher body weight compared with the control.

In the NOT a slight tendency to less fear response was found.

HLR was statistical significant lower in the PTT group than in the control group. Acute stress (for example during slaughtering) is typically related to increase in energy mobilisation.

Hence, our hypothesis was that PTT chickens, especially the males, can mobilise more energy during acute stress. This hypothesis was confirmed.

Male chickens have higher increase in blood T3/T4 level during acute stress, which was accompanied by similar increase in stress hormone level (cortisol and corticosterone).

In females only slight changes in metabolic and stress hormones were observed, which corresponds with NPY expression in a previous experiment.

It has to be noted that all results are similar in both growing trials. It means that the long lasting effect of PTT was repeatable. ■

## Body weight gain and feed conversion in cockerels

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Laying-type cockerels or spring chicken cannot be reared economically. But routine culling of these day-old male chicks is an ethical problem and to find alternative solutions is a great challenge.

Lohmann Tierzucht bred the dual-purpose chicken (producing eggs and meat) in response to growing criticism of conventional practices in modern egg production. Recent research with birds shows that incubation climate may have a long-lasting influence on poultry performance up to the age of slaughter.

In poultry embryos at the end of incubation, peripheral and central nervous thermo-regulatory mechanisms, as well as other body functions, are well developed, so that after mild temperature variations no negative side effects will be expected.

Therefore the following study was carried out to investigate whether short-term variation in incubation temperature during the last days of incubation have a long-lasting effect on performance, also in laying-type cockerels.

### ● Methods

2880 eggs (Lohmann Brown-LB/ Lohmann Dual-LD) were incubated

from days 1-17 under common incubation temperature (37°C). From day 18 until hatching the eggs were sorted in hatch incubators with different temperature programs: 37°C (control) and 10°C over standard for two hours daily (38°C: short-term warm stimulation).

Chicks were sorted by sex and male cockerels were randomly distributed in eight treatment groups (two origins of chicks-LB, LD; two hatch incubators; two different protein/energy-200g crude protein/ 11 MJ AMEN/kg – low; 215g/12 MJ – high) from day 1 to 70 of age. Data were analysed via a three-way ANOVA (SAS).

### ● Results and conclusion

Growing performance of LD cockerels was significantly better compared to LB males (Table 1). Final body weight of LD birds was 1000g higher and feed to gain ratio 10% lower. Short-term temperature stimulation during the end of incubation resulted in a 3.5% higher final body weight by LD cockerels. The daily feed intake and the feed to gain ratio was significantly improved through the increased protein/energy concentration of the 'high' feed. ■

**Table 1. Feed intake, final body weight (age of 70 days) and feed to gain ratio of cockerels.**

Genetic line	Temperature stimulation	Feed level	Feed intake (g/bird/day)	Final body weight (g/bird)	Kg feed/kg weight gain
LB	Control	Low	47.6	1336	2.568
	Control	High	43.3	1360	2.293
	Stimulation	Low	47.1	1336	2.544
	Stimulation	High	44.1	1374	2.309
LD	Control	Low	78.6	2432	2.299
	Control	High	71.4	2482	2.049
	Stimulation	Low	81.9	2558	2.275
	Stimulation	High	73.9	2528	2.070
P-values	Genetic line		<0.001	<0.001	<0.001
	Temperature stimulation		0.14	0.09	0.96
	Feed level		<0.001	0.45	<0.001



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# Embryonic survival ability in laying hens

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Low hatchability negatively affects productivity and animal welfare in the poultry industry.

About 8% of chicken embryos die before hatching each year; the value is much higher in turkeys. Embryonic viability is influenced by a series of factors such as nutrition, hatching technology, egg quality and genetics.

The nutritive components of the yolk are influenced by environmental and genetic factors and could affect the embryonic survival ability. The main goal of this study was to determine metabolite profiles in the egg yolk and to assess possible associations with hatchability.

A large number of hatching eggs were collected from four different lines (commercial white and brown layer lines and experimental unselected lines). Based on estimated breeding values of hatchability traits in hens of aforementioned lines, 1073 egg yolk samples were collected to determine metabolite profiles using gas chromatography-mass spectrometry.

A total number of 105 different metabolites known in egg yolk,

including fatty acids, amino acids, carbohydrates, steroids, glycerides, vitamins and organic acids were detected. The estimated heritability for different metabolites was in the range between 0 and 70%.

Significant differences were found between different lines. Compared to white layers lower amounts of saturated fatty acids and monounsaturated fatty acids were detected in brown layers' egg yolks, whereas the content of polyunsaturated fatty acids, was higher in brown layers.

A significant association between embryonic survival ability and the polyunsaturated fatty acids arachidonic acid and docosahexaenoic acid was found. These fatty acids are essential for the development of the embryonic brain and nervous system in precocial birds.

Furthermore, a significant positive association was observed between embryonic mortality and palmitoleic acid and its precursor palmitic acid, which are known to influence insulin content and glucose metabolite pathways during embryonic development. ■

## Egg deposition of maternal testosterone

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Variability of androgen concentrations in avian eggs is often explained by an adaptive hypothesis according to which differential maternal deposition of yolk hormones may adjust offspring's phenotype to ambient environmental conditions.

In line with this hypothesis, numerous studies have shown that experimentally increased yolk testosterone levels affected a wide array of offspring's traits.

However, a mechanistic view on the variability of yolk androgen deposition is still missing. To understand physiological mechanisms of egg hormone deposition, we analysed a temporal pattern of plasma luteinising hormone (LH), testosterone and

estradiol concentrations during the ovulation-oviposition cycle in two lines of Japanese quail that were divergently selected for low (LET line) and high (HET line) yolk testosterone levels.

After six generations of selection, HET females laid eggs with more than twice yolk testosterone concentrations as LET females. Exact time of egg laying was recorded for each female over one week-period to estimate timing of individual ovulation-oviposition cycle and then serial blood samples were collected at 6.5, 3.5 and 0.5 hours before expected ovulation. In the second experiment, we evaluated responsiveness of LH to a single stimulation with an ana-

logue of gonadotropin releasing hormone (GnRH) in females of both lines. The GnRH challenge was performed around 3.5 hours before ovulation. In HET females, the highest LH levels were found 3.5 hours before ovulation and they corresponded to the expected preovulatory LH peak.

Surprisingly, in LET females, maximum LH concentrations were reached 0.5 hours before ovulation. Moreover, plasma LH levels were significantly higher in HET than LET females 6.5 and 3.5 hours before ovulation with no line differences around the time of expected ovulation. Preovulatory peaks of plasma testosterone and estradiol concentrations were found between 6.5 and 3.5 hours before ovulation in both LET and HET females. Plasma LH

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levels increased five minutes after direct GnRH stimulation but the responsiveness did not differ between lines.

In conclusion, our results demonstrated that high yolk testosterone deposition is associated with the preovulatory peak of LH in the circulation and probably depends on factors that influence hypothalamic-pituitary sensitivity during the ovulation-oviposition cycle. ■

## Incorrect incubation can generate leg problems

J. C. Lopez, T. Hergott

Hybrid Turkey, 650 Riverbend Drive, Suite C, Kitchener ON N2K 3S2, Canada.

The incidence of splayed legs in poults at hatch is low, normally no more than 0.50%, but it can increase notoriously on some occasions.

The aetiology of splayed legs and lameness is complex and has been associated with genetics, nutrition, infection, management, environment and recently to incubation conditions.

The ossification process in turkeys begins during the embryonic period. Simsa and Monosonego-Ornan (2007) detected signs of ossification, such as collagen type X, alkaline phosphatase, and expression of metalloproteinases at 18 days of embryo development. The highest growth rate of bones occurs a couple of days before hatch and a few days post-hatch. Therefore it is crucial that the incubation conditions be ideal to not affect bone development.

Temperature has been suggested to be the most important factor controlling embryo growth and development. Higher temperatures during incubation can affect bone, tendon and muscle development, and thyroid metabolism.

Temperature has an important influence on the thyroid-IGF1-GH hormonal axis that controls growth plate chondrocyte differentiation, and bone development in general.

High temperatures also depress the expression of collagen type X and Transforming Growth Factor Beta, two important proteins involved in bone ossification. Additionally, to accelerate embryo growth to rates that demand higher oxygen consumption than can passively diffuse through the pores of the eggshell, the embryo shifts energy metabolism from lipids of the yolk, which

requires oxygen, to glycogen that the embryo stored in muscles.

If the yolk is not absorbed during this period, bones will not receive nutrients critical for their early development and bone modelling and remodelling.

The overheated poults may have lower muscular strength to stand up at hatch because they have lower glycogen reserves in the muscles and their myofibres are also thinner.

When acidity increases important contractile and metabolic functions of muscles are hindered. In the case that acidity is not regulated, the accumulation of lactic acid may be a factor in muscular fatigue.

Sometimes, this effect can be severe and cause late embryo mortality, but frequently the overheated poults that hatch will be lethargic, may appear exhausted, slow to search for feed and water, and potentially become the starve outs at the farm increasing the first week mortality.

It has been reported that early low and later high incubation temperature can generate thinner gastrocnemius tendon fibres and differing collagen banding patterns during subsequent growth.

Christensen et al. (2007) reported that in turkeys, incubation temperatures higher than 38°C and oxygen concentrations below 21% at the plateau affected muscle growth and physiology.

In conclusion, ossification of bones begins during the embryonic period. Independent of the turkey strain stressful conditions during artificial incubation such as high temperature and low levels of oxygen can affect bone development. ■

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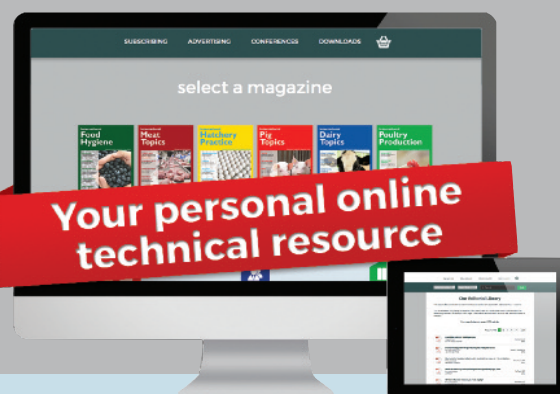
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# Effects of storage on egg components

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Egg quality is a general term that relates to various standards that are imposed on eggs. This quality usually embraces a range of quality characteristics such as shell colour, albumen quality amongst others.

It is therefore necessary to store eggs properly to avoid or reduce the rate at which the quality declines. Egg quality has also shown to be an influencing factor in hatchability and chick quality in general.

Therefore, studies were conducted to determine the influence of storage temperature, condition and duration on egg quality characteristics, shelf life and blastodermal size.

A total of 110 eggs were used for two experiments. In the first experiment, a total of 60 table eggs were divided into two treatments of oil and non-oil coating.

Eggs ( $n=10$ ) for each treatment were stored for either 0, 2, 4, 6, 8 and 10 days at ambient temperature.

A Completely Randomised Design (CRD) in a 2x5 factorial arrangement was used.

Experiment two comprised of two treatments of cold storage ( $18^{\circ}\text{C}$ ) and ambient temperature storage ( $23-26^{\circ}\text{C}$ ).

Fertile eggs under each storage condition were stored for 1, 3, 6, 10 and 14 days.

Parameters measured included

proportions of yolk, shell, albumen and blastodermal size. Data was analysed using the SAS Proc. GLM procedure ( $P<0.05$ ).

The results showed that in experiment 1, shell thickness was affected by oil preservation. Yolk weight and Haugh unit were significantly affected by storage duration. The Haugh unit decreased as the storage days increased.

In experiment two, the egg weights were not affected significantly by storage conditions but were significantly affected by storage duration and interactions between storage condition and storage duration.

The blastoderm size decreased significantly in cold temperature compared to ambient temperature and increased significantly as the day of storage increased. In a similar way, the yolk weight increased as the day of storage increased.

Based on the research findings it was concluded that in table eggs egg quality as measured by Haugh unit is not affected by oil preservation but quality decreases with increasing storage duration.

In fertile eggs while the blastoderm quality is dependent on both storage temperature and duration, the egg components of yolk, shell and albumen were more dependent on storage duration. ■

# Lighted incubation and leg bone development

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Hatcheries incubate eggs in complete darkness, while hatching eggs are regularly exposed to light in a natural situation.

It can be speculated that light during incubation will influence bone development through the pathways of melatonin (involved in bone development with a rhythmic darkness-dependent release pattern) and increased embryonic activity.

The present experiment aimed to investigate effects of light schedule throughout incubation on leg bone development during embryonic development, at hatch, and in later life in broiler chickens.

A total of 744 Ross 308 eggs of a 40 week old breeder flock were incubated from embryonic day (E) 0 until hatch at one of three light

schedules: continuous darkness (24D); 12 hours of darkness, followed by 12 hours of light (12L:12D); and continuous light (24L).

Eggshell temperatures were maintained at  $37.8^{\circ}\text{C}$  throughout.

From E6 until E14, 10 embryos per measurement, per treatment ( $N=270$ ) were removed from the incubator daily for measurement of ossification of the femur and tibia through histological staining.

50 chicks per treatment ( $N=150$ ) were sampled within three hours after hatch to determine leg bone measurements (tibia and femur weight, length, width, and depth).

108 chicks per treatment were moved to a grow out facility and sampled for leg bone measurements

at D21 ( $N=162$ ) or D35 ( $N=162$ ).

On E13, femoral ossified percentage was higher for 12L:12D than for 24L (+2.8%) and 24D (+3.2%;  $P=0.002$ ) and on E14, it was higher for 12L:12D than for 24L (+5.5%;  $P=0.008$ ). At hatch, femur length was higher for 12L:12D than for 24D (+0.32mm) and 24L (+0.45mm;  $P<0.001$ ).

Tibia weight differed among treatments ( $P=0.02$ ), but after Bonferroni adjustment, LS Means were no longer significantly different.

At day 21, tibia length was higher for 12L:12D than for 24L (+1.62mm;  $P=0.01$ ). At day 35, femur depth was higher for 24D than for 24L (+0.28mm) and 12L:12D (+0.23mm;

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$P=0.01$ ). Femur weight was higher for 12L:12D than for 24L (+0.65g;  $P=0.03$ ).

To conclude, applying a 12L:12D rhythm during incubation had a stimulatory effect on embryonic ossification and bone development at hatch and in the grow-out period compared to 24L in particular. ■

# Reprogramming of broiler growth and immunity

M. Bowling<sup>1</sup>, R. Forder<sup>1</sup>, R. Hughes<sup>2</sup>, S. Weaver<sup>1</sup>, P. Hynd<sup>1</sup>  
<sup>1</sup>School of Animal and Veterinary Science, University of Adelaide, Roseworthy Campus, Adelaide 5005, SA, Australia. <sup>2</sup>South Australian Research and Development Institute, Roseworthy Campus, South Australia 5371, Australia.

Reprogramming of developmental events is increasingly recognised as having lifelong effects on animal health, welfare and productivity. Whilst most studies have concentrated on metabolic effects of reprogramming, the immunity of the progeny may also be compromised.

This is of particular significance in broiler birds which are prone to infectious diseases post hatch.

Broiler breeder hens are feed restricted to 50% of ad libitum feed intake, leading to a state of chronic hunger. This persistent hunger may cause stress to hens, leading to reprogramming of progeny immunocompetence.

This study examined the link between maternal stress caused by feed restriction in hens and the ability of their offspring to respond to an immune challenge.

Thirty six Cobb 500 broiler breeder hens were maintained at three levels of bodyweight; 3.4kg, 3.6kg and 4.0kg, over 19 weeks.

Hen behaviour was observed daily using an ethogram over two weeks of lay, and serum was collected at 31 weeks for corticosterone levels.

From these hens, 170 viable chicks were hatched, weighed and placed into group rearing pens of 10 birds from the same hen treatment group, with three replicates of each group. Half of the chicks from each hen were given a series of three injections of lipopolysaccharide (LPS) E. coli O55:B5 at 16, 18 and 20 days old.

Birds were injected at a dose rate of 0.5mg/kg bodyweight, intraperitoneally. Blood samples were collected from the brachial vein of three birds per pen on days 21 and 35 and

heterophil/lymphocyte (H/L) cells were counted. H/L counts were completed by counting 100 cells per slide, three times. Birds were grown until 42 days old.

Hens maintained at a lower bodyweight showed increased pecking behaviour compared to hens at a higher bodyweight ( $P<0.05$ ).

Corticosterone levels were also higher in low bodyweight hens ( $P=0.13$ ). Together these results indicate an unfulfilled hunger drive and possible stress in these birds.

Hen bodyweight also influenced progeny growth from days 35-42 in male birds ( $P<0.05$ ). Males from heavy hens grew heavier in this week than those from medium and low bodyweight hens.

Sex effects were also observed on day 23 H/L counts ( $P<0.05$ ) with a higher H/L ratio in female progeny from heavy hens compared to male birds from all hens, and females from low and medium bodyweight hens, demonstrating an effect of hen bodyweight on the response of female birds to an LPS challenge.

Females from heavy hens were therefore more sensitive to the LPS immune challenge and increased immune cell numbers to a greater extent than those from hens restricted to lower bodyweights.

From this study, a link between hen bodyweight and progeny growth and immunity was demonstrated through differences in growth, circulating immune cell counts and response to an immune challenge (LPS).

The mechanism behind these differences needs to be investigated further as well as differences between males and females observed in this study. ■

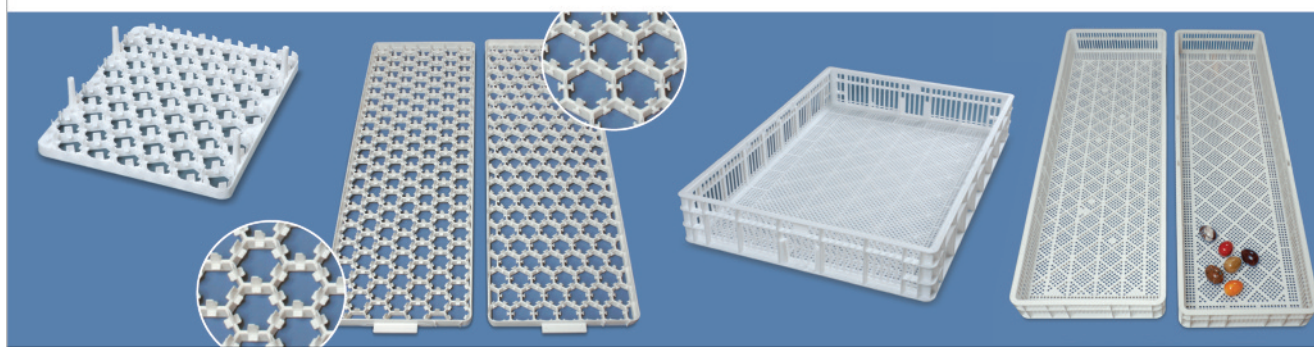


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# Surviving the data mountain in the hatchery

Nick French

Aviagen Ltd, Newbridge, Midlothian, EH28 8SZ, Scotland, UK.

Hatcheries collect large quantities of data to monitor performance and to make sure equipment are operating within set operating limits. These data are a valuable resource for the hatchery, and can be used to identify problems and areas where improvements can be made. To achieve this it is essential that data are handled and analysed correctly.

Good data analysis requires data to be stored in a database, effectively all the data to be analysed is in a single table or Excel sheet consisting of continuous columns and rows.

The quality of the data analysis will also depend on the quality of the data: errors in the data will result in errors in the analysis.

One of the largest tasks when undertaking a data analysis is the validating of the source data and this can be done using a variety of methods:

- Plotting all the data points to look for extreme values.
- Sorting or filtering data to look for values outside expected ranges.
- Check for consistent naming.

Reviewing data is an important management function and should be done routinely. The use of Excel Pivot Tables and Charts can be extremely powerful tools to help organise data and present the information in a meaningful way.

Creating dashboards, where key management data are presented in tables and charts in a single view, can also be a powerful way of monitoring the performance of the hatchery. Key to presenting data is that it shows performance against targets and that it highlights problems.

Statistical analysis can be a very powerful method for truly understanding the factors that are affecting performance.

The advantage of statistical methodology is that it can include

many factors at the same time within the analysis so that each factor can be evaluated when all the other factors have been accounted for. It is often stated that a statistical analysis can measure the pure effect of a given factor on performance.

There are many techniques and computer programs that allow the user to carry out a statistical analysis, but all require the user to have some knowledge of statistical methodology. The main methodologies used to analyse hatch data are multiple regression, standardised least squares and general linear models.

Potential pitfalls when running a statistical analysis are that factors being investigated are not independent of each other: class variables are confounded or continuous variables are highly correlated with each other.

The other type of data analysis that may need to be undertaken in a hatchery are results from a field trial, for example comparing the performance of two incubator settings.

Running a successful hatchability field trial has three key requirements:

- As much as possible make sure everything, other than the factor being investigated, is as equal as possible. For example if comparing two incubation settings make sure the eggs in the two test setters are from the same flocks and have the same egg storage.

- Use lots of eggs. To detect a 2% hatch gain will require approximately 4,800 eggs per treatment and to detect a 1% hatch gain will require approximately 20,000 eggs.
- Repeat the test several times, typically three or more, to make sure the results are consistent. When repeating a trial, if possible change which incubator is used for the control and test treatments.

# Incubation temperature and chick quality

N. Leksrisompong, K. A. Walter, A. D. Nicholson

Aviagen, 920 Explorer Boulevard NW Huntsville, AL 35806 USA.

It is well recognised that eggs which have been overheated during incubation do not hatch as well as they would have if incubated under more appropriate conditions. However, there is less information available about the direct impact of high incubation temperatures on the performance of the chicks after they hatch.

Two experiments were conducted at the Aviagen product development center in the USA to investigate the effect of increased eggshell temperature during mid to late incubation on hatchability, chick quality, yolk sac, heart, digestive organs, and broiler performance.

Three treatments were imposed in each experiment. Egg shell temperatures were recorded using Gemini data loggers feeding to a wireless broadcast system that could be interrogated in real time. Incubator conditions were changed as necessary to maintain the desired egg shell temperature. From set to day 10, all the eggs were held at the same eggshell temperature, 100.0°F (37.8°C).

Treatment 1 was the control, and eggshell temperature was set at 100.0°F all the way through to transfer. Treatment 2 was set at 101.5°F (38.1°C) and Treatment 3 at 103.0°F (39.4°C) from day 11 to transfer.

In the first experiment, 2,310 Ross 308 broiler hatching eggs from a 38 week old flock were used in each treatment. The eggs were taken through to hatch, and full hatch data were recorded. Chick quality was evaluated after takeoff and the chicks placed as broilers, reared to 38 days.

The treatment of 100.0°F (37.8°C) eggshell temperature throughout incubation period resulted in better hatchability, a higher percentage of first quality chicks, a higher body weight at 38 days, and improved FCR at 38 days when compared to

incubation with eggshell temperatures of 101.5°F (38.6°C) or 103.0°F (39.4°C).

In the second trial, 1,815 Ross 308 and 1,815 Ross 708 broiler hatching eggs from a 39 week old flock were placed for each treatment. Full hatch data were collected; chicks were evaluated for chick quality and then placed as broilers, grown through to 53 days. The treatments were the same as in the first trial.

Eggs that were hatched using a 100.0°F (37.8°C) eggshell temperature throughout the incubation period had better hatchability and body weight at 53 days when compared to incubation with eggshell temperatures of 101.5°F (38.6°C) or 103.0°F (39.4°C).

The chicks on the control incubation treatment had bigger hearts as a percentage of yolk-free body weight than those incubated on the two hotter treatments.

Chicks that were hatched after a constant 100.0°F (37.8°C) eggshell temperature throughout the incubation period had fewer red hocks, bad navels, lower residual yolk weight, and better liveability at 53 days compared to the high temperature treatments on both Ross 308 and 708.

In both trials, hatchability was as expected when eggs were incubated too hot. Broiler performance was impaired when higher egg shell temperatures were imposed from 11-18 days incubation. ■

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## Incubation in hot, humid climates

# 68

www.pasreform.com

by Gerd de Lange, Senior Poultry Specialist, Pas Reform Academy

Successful incubation in hot, humid climates poses a number of challenges for the hatchery, one of which is achieving sufficient weight loss at transfer to deliver high hatchability and optimal chick quality. Take for example a moderately hot and humid climate of 30°C with 75%RH. With these properties, air at sea level contains approximately 20g H<sub>2</sub>O/kg air.

If we assume a setter climate of 37.5°C and, with the aim of achieving optimal weight loss from fresh egg weight at transfer of 12%, we choose a set point of 50% RH, the air in the setter will contain approximately 21g H<sub>2</sub>O/kg.

If the setter's air valves are closed, evaporating water from the eggs will increase both the absolute (gH<sub>2</sub>O/kg air) and relative (RH%) humidity of air in the setter. This limits evaporation from the eggs, making it impossible to achieve 12% weight loss.

By ventilating the incubator with fresh air, evaporating water from the eggs can leave the incubator via the outlet, while maintaining an optimal incubation climate.

However, if we stay with the above example, each kilogram of air entering the incubator can extract only 21g – 20g = 1 gram of water.

This means that a lot of ventilation, starting early in incubation, is needed to allow the hatching eggs to lose sufficient weight.

Adopting a non-linear weight loss profile that starts incubation with high RH% (by sealing the setter for several days), then compensating for low weight loss by applying a low RH% (ie. less than 45%) during the second half of incubation, is not feasible in hot, humid conditions.

Such low levels of RH% can simply not be achieved, even when air valves are 100% open. This is because when RH% set point inside the setter is, for example, 45%RH, the inlet air (30°C/75%RH=20g H<sub>2</sub>O/kg) already contains more water (37.5°C/45%RH = approximately 18g H<sub>2</sub>O/kg).

In this scenario, a linear weight loss profile based on a constant RH% of approximately 50% is much easier to achieve.

It is possible, at least partially, to overcome these challenges and minimise the need for high ventilation rates early in incubation, by optimising the temperature and relative humidity of inlet air using an Air Handling Unit.

Outside air of 30°C/75%RH can be climatized, for example, 25°C/60%RH, which significantly reduces the water content of the air from 20g H<sub>2</sub>O/kg to approximately 12g H<sub>2</sub>O/kg.

Again using the above example, each kilogram of air entering the incubator now has the capacity to extract 21 – 12 = 9 gram of water.

There is a downside to treating hot, humid outside air in this way. It requires energy, both for the cooling needed for dehumidification and also to subsequently re-heat the air to a recommended inlet temperature of 25°C (±2 °C).

This energy cost will increase the cost price of the day-old-chick – but it does give the hatchery manager an additional tool with which to better control hatchability and chick quality in a challenging, hot and humid climate.

### Advice

- Aim for a linear rather than a non-linear weight loss profile in hot, humid climates, to prevent insufficient weight loss that will inevitably arise from failing to achieve the low %RH set points required during the last days of incubation using a NLWL-profile.
- Pre-condition hot, humid outside air to the inlet specifications recommended by your incubator supplier, to reduce its moisture content.
- Perform a cost-benefit analysis within these specifications, to establish the most advantageous combination of temperature, relative humidity and energy usage to achieve the highest hatchability and optimum chick quality.

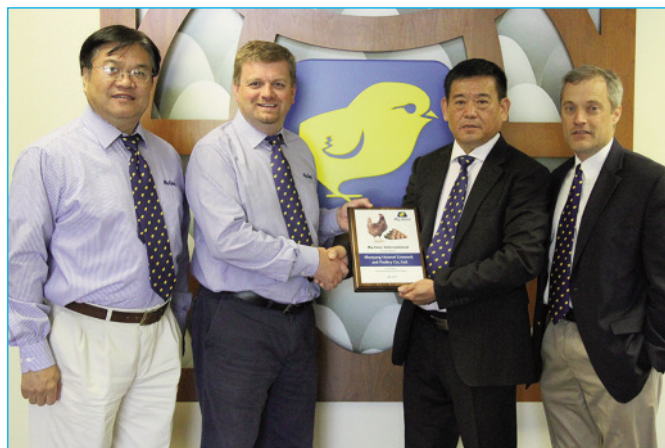
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# International NEWS



Hy-Line International, a world leader in layer poultry genetics, celebrated its 30 year partnership with Shenyang Huamei Livestock and Poultry Co Ltd of Shenyang City, China by hosting technical seminars with more than 350 pullet growers and layer farm owners and managers in Shandong and Taiyuan Provinces of China. Participants learned best practices for maintaining healthy commercial laying stock for optimal production. Pictured right to left: Charley Zheng, regional business manager in China for Hy-Line International, Jonathan Cade, president of Hy-Line International, Zhaoren Li, owner of Shenyang Huamei Livestock and Poultry Co Ltd, and Thomas Dixon, international sales and marketing director for Hy-Line International.

www.hyline.com

## South African success



The fourth annual Arbor Acres roadshow recently took place across South Africa. The event was organised and coordinated by Arbor Acres South Africa (AASA) and began in the Durban region before moving north to finish in Polekwana.

The roadshow has increased in popularity year on year, with parent stock managers, broiler managers, hatchery managers, nutritionists and veterinarians across South Africa making it a key date on the industry's calendar.

A number of local and international team members from Aviagen spoke on a range of different topics; from an overview of Arbor Acres distribution worldwide to presentations on improving gut health issues and other ways to prevent diseases.

On top of this, Dominic Elflick, International Product Analyst, Aviagen, analysed data submitted by local customers, who attended the events. Each customer received a detailed report on their own performance, which was also shown compared to Arbor Acres performance data to provide insight into how

their performance compares. "Over the last four years we have managed to develop an unprecedented style in South Africa with these roadshows," Deon Venter, Technical Manager for broilers and breeders, AASA, told International Hatchery Practice.

"Customer feedback has improved each year and the new dates of this event are greatly anticipated. We have worked hard to bring value to the operations of our customers through these events and they are a great platform to convey news on the Arbor Acres bird, both commercially and management-wise."

Puzant Dakessian, International Commercial Manager, Aviagen, spoke at the event and added: "After witnessing the very high level of commitment, planning and meticulous organisation put into the event by the local AASA team it will now be our joint mission to continue to take the roadshows to the next level in the coming years. We are geared up and committed to supporting our distributor with this mission to make Arbor Acres the customers' first choice in South Africa."

www.aviagen.com





## Russian turkey hatchery



Eurodon, Russia's largest turkey meat producer, has opened a new complex that will increase the capacity from 23,000 to 163,000 tons of turkey meat per year. The hatchery is equipped with high-tech Petersime setters and hatchers.

Hartmann, Petersime's distributor for Russia, has conducted the configuration, delivery and installation of the equipment as well as the commissioning and the training of the staff for this new project.

Petersime has delivered 48 BioStreamer 8S and 20 BioStreamer 4H for this project. It includes the Eco-Drive technology to reduce the energy consumption of the incubators,

the OvoScan system to measure online the eggshell temperature, the Synchro-Hatch module to minimise the hatch window, the Automatic Disinfection System and a cooling system.

The hatchery will have an annual capacity of 17.6 million eggs. The new facilities will also include a meat processing plant, a feed mill and poultry houses.

The construction of the hatchery started in 2014 and was finished in record time. By May 2015 it was fully operational.

"We have an outstanding cooperation with the Hartmann company and their experienced professionals," Vadim Vadeev, General Manager of the Eurodon Group, told International Hatchery Practice.

"Eurodon is one of the most up-to-date turkey breeding complexes in the world. Therefore we decided to provide our hatchery with the latest modern and innovative equipment from Petersime to meet our quality standards."

[www.petersime.com](http://www.petersime.com)



### AFR France expansion

AFR France, an Aviagen parent stock hatchery has expanded to 14 million chicks per year with Emka Incubators.

After an initial trial set-up of Emka Incubators' Dry Hatch; teggnology 27, chiller-less cooling with 27°C water, the company has further expanded and installed four new Technology 27 Hatchers.

The close cooperation and technical support allowed for a smooth implementation and operation of the new equipment.

Mostafa Rhouass, Production Manager, concedes that after his first reticence in the use of lukewarm water for managing the hatcher cooling he is now completely convinced of the benefits and advantages of the 'Dry Hatch'. Not only do the chicks hatch dryer, stronger and more uniform but the financial savings of the chiller-less cooling are significant. The stability and performance of the Emka Incubators' Teggnologic27 system is now fast becoming generally accepted.

[www.emka-incubators.com](http://www.emka-incubators.com)



### Cobb's new European director

Dr Randy Borg has been appointed as European director of genetics for Cobb-Vantress Inc.

In his new role, he is responsible for directing the breeding programme at the Cobb pedigree farm at Herveld in the Netherlands, representing research and development in support of Cobb in Europe, the Middle East and Africa and managing the day-to-day external research activities established with European collaborators. Dr Borg is based in the Netherlands and will report directly to Dr Mitch Abrahamsen, Cobb vice president of research and development.

He joined Cobb in 2008, first serving as the pedigree farm geneticist for the Three Springs pedigree complex in Oklahoma, USA, and has most recently been working within the company's quantitative genetics group. Before moving to Cobb, he worked for Pfizer Animal Health (now Zoetis). He holds a PhD in animal breeding and genetics from Virginia Tech University.

[www.cobb-vantress.com](http://www.cobb-vantress.com)



Hatchery **TIPS** 11

## CALIBRATING ELECTRONIC HUMIDITY SENSORS

Calibrating the humidity sensors in incubators can be tricky. However, if the machine has electronic humidity sensors a saturated solution of a specific chemical compound, presented to the sensor in a sealed container, will give an accurate and predictable reading which can be used to calibrate the machine. Saturated solutions of different salts will, depending on the temperature, always give the same reading on an electronic humidity sensor. Two of these compounds are suitable for use to calibrate setter or hatcher electronic humidity sensors at incubation/hatcher temperatures (98-100°F).

Magnesium nitrate hexahydrate [Mg(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O] will read 50% and sodium chloride [NaCl] will read 75% RH. If the machine shows a wet bulb temperature, rather than a percentage RH, then the predicted reading will alter slightly depending on the air (dry bulb) temperature in force at the time of calibration. The table below shows what to expect at different dry bulb temperatures for both chemicals. Correct preparation of the solution is very important. Too much or insufficient water addition will give inaccurate results. Salts should be of consistent purity, ideally laboratory grade.

### Steps:

1. Fill the sensor protection bottle quarter full with the dry salt. Prepare a syringe full of water.
2. Add a small amount of water to the salt and shake well.
3. When the salt becomes sticky (it will stick to the bottle) the solution is ready to use. Turn off the humidity alarm of the machine.
4. Screw the bottle to the fitting above the humidity sensor. The humidity reading will stabilise once the salt solution has reached incubation temperature (about an hour).
5. Once the humidity becomes stable, calibrate your sensor to the expected value for the machine temperature at the time (see Table).
6. Remove the bottle to finish calibration, turn on the alarm and run the machine normally. Humidity will shortly start showing actual level. One batch of solution can be used for five machines.

It is good practice to repeat this calibration every set for single stage machines and every month for multistage machines.



Dry bulb temperature (actual machine temperature)	Approximate wet bulb temperature (°F)	
	Sodium chloride	Magnesium nitrate hexahydrate
100	92.5	83.5
99.5	92.0	83.0
98.5	91.0	82.2
98.0	90.5	81.8

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# International NEW

## Kenchic achieve outstanding hatch

Kenyan poultry company Kenchic recently purchased Jamesway Platinum 2.0 incubators. They achieved a 90% hatch on their first hatch, with the birds looking good.

Under its slogan 'Chicken of Choice', Kenchic supplies chicken to international franchises like Galitos, Steers, Kentucky Fried Chicken (KFC) in East Africa, airline caterers like NAS, leading hotels, caterers, and fast food restaurants, and all the 30 Kenchic Inns countrywide.

Its Athi River hatchery in Nairobi has the capacity to hatch one million chicks per week. Recently, Kenchic installed new state-of-the-art equipment, including the advanced Jamesway Platinum 2.0 incubation system at its hatchery, bringing the total number of Jamesway incubators at the hatchery to over 30.

"We are very satisfied with the new Platinum P2 incubators," Jonathan Bovard, hatchery manager, told International Hatchery Practice. "We completed the first hatch in August and the results were most impressive. The hatch rate was 90% of total egg set and all chicks were of fantastic quality, arguably the best I have seen."

www.jamesway.com

## Appointment for Hubbard Asia

Hubbard has appointed Grant White to the role of Senior Technical Service Manager. He will report to Dr Eric Bonjour, Global Director of Technical and Veterinary Services, and assist Hubbard's existing technical team in Asia to support their rapidly growing customer base.

Grant comes to Hubbard as a very experienced Poultry Operations Manager. For more than 20 years he has successfully been managing breeders from great grandparent to parent stock and also worked for nine years as Hatchery Manager at Tegel Foods New Zealand. Most recently Grant worked with Aviagen Australia as Farm Operations Manager.

www.hubbardbreeders.com

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## Genomic selection tools



Arkansas-based Cobb-Vantress and Hendrix Genetics, headquartered in Boxmeer, the Netherlands, have signed their third consecutive Joint Development Agreement (JDA).

Both companies will continue to investigate the fast-growing field of chicken genomics together and develop the next generation genomic selection tools for the benefit of both companies.

Cobb-Vantress and Hendrix Genetics set up their first JDA in 2008 and, after seven years of successful partnering in research and development, both companies are convinced there is much more to discover with new genomic selection tools. The unique industry collaboration stimulates synergy and insight within and between both teams that can contribute to improved breeding programs and increased global production of safe, sufficient and secure food.

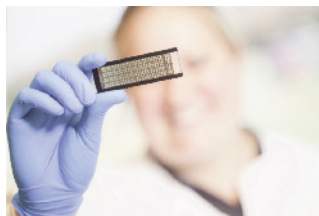
Dr Mitch Abrahamsen, Senior Vice-President of R&D at Cobb-Vantress, said: "The joint efforts of the Hendrix and Cobb R&D teams have provided more scale to our research program and delivered surprising new insights over the years. "Although the basics of breeding

and genomics apply in most animal sectors, it helps to exchange knowledge across species and breeding programs."

Dr Gerard Albers, Chief Technology and Innovation Officer at Hendrix Genetics, said: "The basic idea we had seven years ago to start sharing information and promoting our expertise has proven to be very successful. Our teams of researchers are working side-by-side as one team exploring the chicken genome."

A clear example of the success of the last JDA is the development of a cutting-edge SNP Chip for chickens, a tiny glass slide that can analyse some 60,000 variations in DNA sequences – or Single Nucleotide Polymorphisms (SNPs) – which act as genetic markers and are specifically targeted to Cobb and Hendrix chicken breeding lines.

[www.cobb-vantress.com](http://www.cobb-vantress.com)



### Hendrix Genetics partners Coolen

Hendrix Genetics has reached an agreement in principle to acquire a controlling stake in turkey distributor Coolen, who owns the largest turkey hatchery in the Netherlands.

The transaction is expected to close before year end, following customary due diligence and other approvals. Through this partnership, customers will benefit from a better flow of knowledge and quality turkey poults from Hendrix Genetics as primary turkey breeder.

For Hendrix Genetics, the Netherlands can play a strategic role as supplier to Germany and as an export base for markets outside of Europe. As well as commercial turkeys, both companies also see great opportunities in developing the market of traditional and bronze turkeys.

[www.hendrix-genetics.com](http://www.hendrix-genetics.com)



### New online resource

Merial, the animal health division of Sanofi, has launched [vaxxitek.com](http://vaxxitek.com). This online, easy-access resource is dedicated to keeping the poultry community informed about Vaxxitek HVT+IBD and other Merial science and service offerings across a range of mobile and desktop devices.

User-friendly navigation means that users can quickly find what they need. For example, the knowledge base is at the heart of the new website with content varying from scientific literature to customer testimonials. It contains summaries of field trials on poultry health and performance issues, peer-reviewed articles, newsletters, online training presentations, and more.

Video content can also be found on the site highlighting business experiences with Vaxxitek HVT+IBD as well as footage explaining the



## Spanish hatchery upgraded



Global vaccine egg supplier Valo BioMedia has upgraded its European Granja Rodriguez Serrano hatchery in Spain in record time, with new setters from NatureForm Hatchery Technologies.

The 17-setter installation, a new for old replacement programme, was completed in a record two-week timescale by NatureForm Hatchery Technologies, avoiding any disruption to production in the vaccine hatchery.

"With extensive experience in the vaccines market, NatureForm totally understood the very specific requirements for this project," Steve Warren, NatureForm CEO, told International Hatchery Practice.

"Within 14 days, all the existing machines were dismantled, floors were repaired, electro-mechanical works were completed and the new setters were installed, ready to resume incubation in line with Granja Rodriguez Serrano's time-critical production schedule."

Valo BioMedia is a leading global supplier of vaccine eggs, which are

used to produce both human and animal vaccines, as well as for pharmaceutical research purposes.

Alongside Spain, the company has facilities in Germany, Brazil, Mexico and North America, for a localised presence that is critical to working in partnership with its research and pharma clients worldwide.

With a long history of working with NatureForm incubation, Granja Rodriguez Serrano's decision for the replacement of setters in the Spanish hatchery was, says Antonio Rodriguez Serrano, Manager, a logical choice.

"NatureForm has always been an excellent, knowledgeable and responsive partner in the past. As a vaccine egg supplier, our production schedules are extremely time-sensitive. This refurbishment enabled us to continue meeting our current commitments, while also ensuring that Granja Rodriguez Serrano is primed and ready for future growth, as a result of increased demand for vaccine eggs in the market," Antonio added.

[www.natureform.com](http://www.natureform.com)

vaccine's development, handling, production and underlying technology.

"One of the world's top-selling avian health products, it has been administered to more than 60 billion birds worldwide," Jérôme Baudon, Merial's Global Head of the Avian Business Unit, told International Hatchery Practice. "With well over a decade of scientific and field evidence demonstrating its value to the global poultry industry, [vaxxitek.com](http://vaxxitek.com) is the right platform to share this wealth of knowledge with our current and prospective customers."

[www.vaxxitek.com](http://www.vaxxitek.com)



### New Petersime hatchery in Russia

The Tambov Turkey hatchery in Russia is now officially open. It became part of the first phase of the construction of a new ultra-modern poultry complex for the production of turkey meat with the projected output of 50,000 tons per year.

The facilities have been built within the framework of a unique international project launched by Cherkizovo Group in 2012 in partnership with Grupo Fuertes, Spain's largest producer of turkey meat.

[www.petersime.com](http://www.petersime.com)

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# International NEWS

## Hands-on learning in Africa



Thirty five delegates attended a three-day Cobb breeder, hatcheries and veterinary seminar at Lusaka, Zambia, hosted by African Poultry Development, the group name of Hybrid Poultry (Zambia), Kenchic (Kenya), Interchic and Tanbreed (Tanzania).

"This provided a unique opportunity to get together and benefit from technical and practical training from experts in their field," said Simon Wilde, General Manager.

"From the feedback we realise how valuable the programme of talks, practical workshops and site visits was to all the delegates."

Technical presentations were given by Cobb poultry specialists Pieter Oosthuysen and Dr Andre Derkx, and Richard Scorgie from Hybrid Poultry Farms.

Pieter Oosthuysen emphasised the importance of good rearing programmes for high egg production and covered male management and

a new approach to male feeding for optimal reproduction.

Dr Derkx shared his knowledge on vaccination, health monitoring and biosecurity, while Richard Scorgie demonstrated chick grading and embryo diagnosis.

[www.cobb-vantress.com](http://www.cobb-vantress.com)



### Redevelopment paying off

Following new investment and a repurposing of facilities from egg to broiler meat production, Khazakhstan's Kysylzhar-Kus is on track to meet 70% of local demand for broiler meat in its first phase of operations, with a recently commissioned Smart hatchery from Pas Reform delivering strong performance. The new hatchery includes SmartSetPro setters, each with a capacity of 57,600 hatching eggs, SmartHatchPro hatchers and a complete HVAC system to combat the high cost of energy in the Northern region of Kazakhstan.

The new facility, which also incorporates nine broiler houses, a slaughterhouse, feed mill and plant for meat and bone meal production, is served by its own boiler and water supply and has created employment for 130 people.

"The first phase will produce 4,000t of poultry meat per year, which provides for 70% of local market demand," Nikolai Rudenko, general director, told International Hatchery Practice.

"Phase two expansion will double capacity to 8,000t, which will fully

meet the needs of local consumers."

The hatchery's first chicks were from Ross breed hatching eggs, supplied by Karagandinskaya PF.

In addition to installing and commissioning Kysylzhar-Kus' new incubation and HVAC systems, Pas Reform Russia has provided project engineering services and will continue to support the hatchery with regular field visits and technical support from Pas Reform Academy.

[www.pasreform.com](http://www.pasreform.com)



### Algerian celebration for Petersime

Petersime has celebrated shipping its 10,000th Vision controlled incubator. Farid Ferhat, Managing Director of Sarl Seravic and SNC Grand Couvoir in Algeria was the lucky one to receive this special delivery.

Petersime incubators are robust, reliable and well performing in the field. With the Vision controller, these machines are easy to use. Features such as delayed start function, visual history of the incubation process and clear alarm overview allow easy operation.

[www.petersime.com](http://www.petersime.com)

# Diary

## 2016

### IPPE

26-28th January

Atlanta, Georgia, USA

[www.ippexpo.com](http://www.ippexpo.com)

### VIV MEA

15-17th February

Abu Dhabi, United Arab Emirates

[www.viv.net](http://www.viv.net)

### Turkey Science and Production Conference

9-11th March

Chester, UK

[www.turkeytimes.co.uk](http://www.turkeytimes.co.uk)

### Poultry Focus Asia 2016

21-23rd March

Bangkok, Thailand

[www.positiveaction.co.uk](http://www.positiveaction.co.uk)

### Ildex Vietnam

23-25th March

Ho Chi Minh City, Vietnam

[www.ildex.com](http://www.ildex.com)

### Victam Asia

29-31st March

Bangkok, Thailand

[www.victam.com](http://www.victam.com)

### Poultry Summit Europe

16-18th May

Utrecht, The Netherlands

[www.viv.net](http://www.viv.net)

### 11th International Symposium on Marek's Disease and Avian Herpesviruses

6-9th July

Tours, France

<https://colloque.inra.fr/marek-symposium-tours2016>

### World Poultry Congress

5-9th September

Beijing, China

[www.wpc2016.cn](http://www.wpc2016.cn)

### VIV China

6-8th September

Beijing, China

[www.vivchina.nl](http://www.vivchina.nl)



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