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1. Stag management to ensure high quality semen

by Dennis Bauman, Technical Service Representative, Hybrid Turkeys, Canada www.hybridturkeys.com

Artificial insemination is a routine practice in the turkey breeder industry. To be successful it requires trained, competent staff and male turkeys that produce quality semen. This article will focus on some of the key areas of stag management to ensure top quality semen is available for insemination.

The two person technique for semen collection.

LIGHTING PROGRAM

While males are in the semen production phase it is important to maintain a minimum of 14 hours of light per day. It has been found this amount and more is best to stimulate semen production.

If males are being raised in curtain sided buildings that allow natural light, you must ensure that you have supplemental light to maintain consistent long day lengths as natural days get shorter.

It is imperative that you never decrease light duration or light intensity while males are in semen production as this will lead to poor quality semen and can cause a decrease in the quantity of semen produced.

NUTRITION

It is important to ensure that proper nutritional needs are met. Feeding regimes and diet compositions should be devised to minimise the development of obesity.

A properly weighted male turkey will produce high quality semen with greater ease. It is always important to note that any changes in diet should be done incrementally and in conjunction with a professional nutritionist.

CLEAN WATER

Water is a basic need of a turkey. What should be noted is that clean water is what can make a big difference. Clean, sanitised water ensures your birds stay healthy by removing an opportunity for bacteria to enter their bodies.

A healthy bird will produce quality semen a lot easier than one with compromised health.

HANDLING

Stimulation and semen collection requires a high amount of handling, so it is important to ensure gentle treatment during this time. Care must be taken when picking up and releasing the males to prevent bruising or injury.

There are many different ways to handle male turkeys to stimulate ejaculation. While there are some single person techniques, the most common technique requires two people. In the two-person technique there is an 'operator' and a 'milker'. The operator is in charge of holding the bird's legs and operating the semen collection apparatus.

The 'milker' is in charge of stimulation, which involves massaging the area around the cloaca.

The 'milker' must take extra care during aspirations and use no more than two strokes. After two strokes, risk of injury to the cloacal area increases, with minimal additional semen being gained.

It is important to work with the bird not against the bird. Proper handling will ensure the males achieve maximum quality and quantity of semen to aid in the production of viable, fertile eggs.

SEMEN COLLECTION

Good quality semen has a thick consistency and a pearly white colour. It is important to collect semen off the end of the phallus only. It is equally important to have a slow aspiration rate to avoid damaging the tails of the spermatozoa, which can compromise the quality of the semen.

As sperm is collected, care must be taken to minimise the collection of unwanted contaminants, such as urates or faecal material.

This can be avoided by a few key management tips:

- Do not feed 4-6 hours prior to semen collection.
- Maintain adequate lighting for easy visual inspection of the semen quality.
- Do not go up the phallus further into the cloacal region during aspiration.

Frequency of collection also plays a role in semen quality. Semen from males should be collected once to twice per week.

Lapses in collection for extended periods can lead to a lowering of semen production and the quality of spermatozoa.

One way to identify if there is a low or reduced number of spermatozoa is that semen may appear grayish in colour and watery in consistency.

Left, a good example of semen. Right, a bad example of semen containing faecal material.

SUMMARY

There are many factors that contribute to the successful production of top quality semen for insemination. In the above we have reviewed the key management techniques that can contribute to this success.

It should be noted that other factors, such as genetics, health, housing type and flock density, also play a role in the production of top quality semen. ■

For more information on stag management visit the Hybrid Turkeys Resources website at: resources.hybridturkeys.com/breeding-production/male-management

2. Biological aspects of turkey egg storage

by Dr Marleen Boerjan, Pas Reform www.pasreform.com

It is well known that handling and storage of hatching eggs, on farms as well as in hatcheries, affects the hatchability and the vitality of the poults. Commonly, eggs arrive at the hatchery a few days after they have been laid, by which time they will have cooled down to storage temperature (15-20 °C) and the embryo will have reached a stage of dormancy where it is ready to be stored before incubation.

The storage period might be a few days or even a few weeks, and the length of time will have consequences. The embryo, albumen and yolk may show signs of age-related deterioration depending on time, temperature and relative humidity.

COOLING OF THE EGGS: ADAPTATION PERIOD

After laying (oviposition), the first climate parameter the egg content and embryo encounter is cooling: from body temperature (40-41°C) to room temperature (18-20°C).

Cooling rates influence formation of the air cell, embryonic development and the diffusion of carbon dioxide from the albumen. After cooling down, a turkey embryo will have developed to an early pre-gastrula stage VIII (Bakst and Wade, 2014), in contrast to the blastoderm in a non-incubated chicken egg, which will have developed to a more mature pre-gastrula stage of XI-XIII (Bakst et al., 1997). The Roman numerals refer to the morphological description of Eyal-Giladi and Kochav (1976).

The release of carbon dioxide during cooling initiates an increase in the pH of the albumen, which facilitates early development and sub-embryonic fluid formation during incubation. The increase in pH probably also facilitates the liquefaction of albumen after oviposition.

It has been suggested that these rapid changes in the albumen are needed to prepare the eggs for incubation that results in optimum hatchability.

For incubation practice, this means that eggs should not be placed in the incubator on the day that they have been laid.

In addition, experienced hatchery managers recommend that eggs should not be placed in the setter immediately after arriving in the hatchery because the egg contents first need to rest so that the yolk and embryo can return to their optimum position for incubation.

THE TURKEY EMBRYO: STAGE OF DORMANCY AND AGEING DURING STORAGE

In recent decades, fundamental research on the development of bird embryos has revealed that the blastoderm in a fresh egg is more than just a sheet of cells organised into a clear centre (area pellucida) and a white ring (area opaca).

Technology has enabled molecular biologists to show that the first steps of functional cell differentiation are initiated during egg formation in the female bird.

This is when the posterior-anterior and ventral-dorsal axes are formed. For example, in-situ hybridisation has shown mesoderm-related gene expression in the non-incubated chicken blastoderm.

On the basis of morphological studies, Fasenko (2007) discussed whether embryos in freshly laid eggs need to reach a stage of complete hypoblast development ('primitive endoderm') before the embryo is able to withstand long-term storage. However, the development of the hypoblast is a complex process, so finding the optimum embryonic stage for dormancy will require more research – in turkeys and other birds.

The effects of egg storage on embryo vitality have been studied for more than half a century, in both chickens and turkeys. Most of these studies addressed embryonic mortality rates and the morphological and cellular changes in the blastoderm during storage of hatching eggs. For example, Bakst and Holm (2003) describe significant morphological signals of cell death in turkey embryos after 21 days of storage.

CONSEQUENCES OF EGG STORAGE FOR EMBRYONIC DEVELOPMENT

Turkey eggs stored for 14 days showed a 10% reduction in hatchability compared with eggs stored for four days. These higher rates of embryonic mortality observed after storage are a direct consequence of cell death.

A reduction in yolk membrane density and strength was also observed in the turkey eggs that had been stored for 14 days, and the turkey embryos hatching from these eggs needed to metabolise more protein to produce sufficient energy to support the final hatching process.

The increased rate of cell death combined with the lack of sufficient energy for hatching might be the reason why turkey embryos from eggs stored for 14 days take 18 hours longer to hatch than embryos from fresh (<4 days old) eggs.

PREVENTING THE NEGATIVE IMPACT OF EGG STORAGE

Arora and Kosin published data on the positive effect of pre-incubation heat treatment of chicken and turkey eggs on hatching results in 1966 and 1968. In 2001 Fasenko and colleagues showed that 12 hours of incubation prior to storage improved the hatchability of turkey eggs stored for 14 days at 15°C.

Probably, the more immature stage of development of the turkey blastoderm, compared to that of the chicken, means that turkey eggs need a 6-8 hour longer prestorage incubation period for any benefit to be derived.

As in day-old chicken hatcheries, heat treatment of turkey eggs is becoming more common practice.

Hatchery equipment manufacturers have even invested in the development of specific heat-treatment incubators. However, application of heat treatment during storage will only have benefits if the eggs are stored under optimum temperatures (15-18°C) and relative humidity (75-80%).

Poor storage conditions will increase the process of age related deterioration of blastoderm, yolk and albumen.

RECOMMENDATIONS FOR PRACTICE

- Investment in high quality climate control (T and RH) in storage rooms on breeder farms and in hatcheries pays off in terms of good hatching results after egg storage.
- Take time to evaluate the heat treatment protocols applied in your hatchery, and optimise them according to its specific conditions, eggs and equipment. ■

References are available from the author on request

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3. Reproductive selection criteria in turkey breeding

by Dr John H, Ralph, Dr Valentin Kremer, Aviagen Turkeys Ltd www.aviagenturkeys.com

The turkey supply chain flows from the breeders through a number of multiplication phases culminating in commercial birds being grown and processed and finally sold to the consumer.

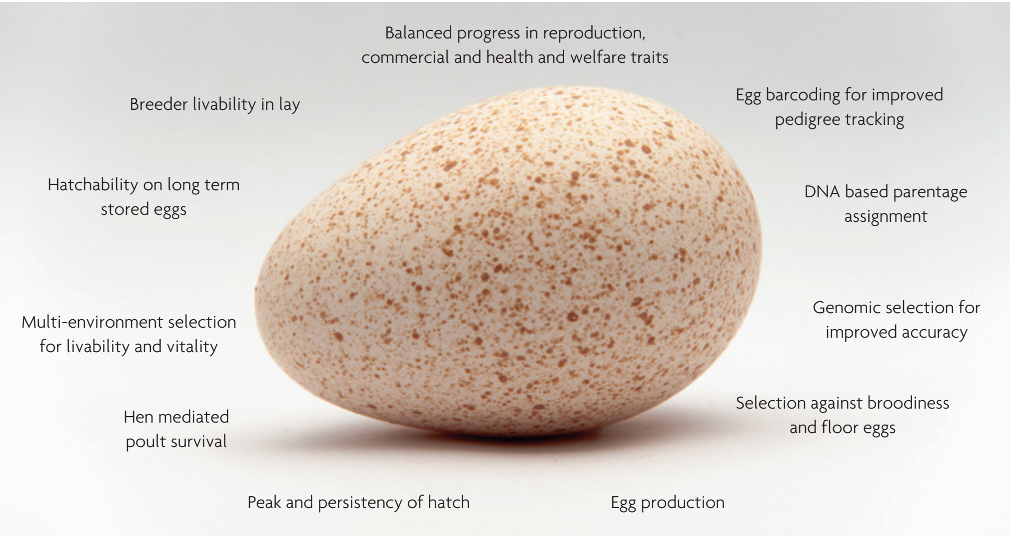
Primary breeders are at the start of this process and receive direction from many sources directly and indirectly through a complex web of communication. The job of breeders is to distil these messages into practical selection criteria so that genetic improvements are delivered along the supply chain. Breeding programmes for turkeys have moved from a focus on productivity related traits towards multi-dimensional breeding goals. Whilst economic efficiency remains highly important, there is an increasing emphasis on traits related to sustainability, welfare and robustness. An example is the sib-testing strategy in which selection candidates are recorded in high-biosecure and high-input environments to maximise expression of genetic potential, while sibs are tested in a lower-input environment with an emphasis to test for robustness including gut health, digestive, and immune function, leg health and liveability. For the breeder hen, improvements in robustness leads to better vitality, flock productivity and resource utilisation.

Reproductive traits (Fig. 1) remain core selection criteria for turkey breeding. They are critically important for breeder flock farmers and hatcheries that need efficient production of consistently high quality, robust poults.

Techniques to improve reproductive genetic potential are continuously being developed. These are leading to demonstrable improvements in breeder performance.

For example, since 2014 European BUT6 egg production to 24 weeks has increased by 2.0 eggs to 111.5 eggs with top quartile flocks achieving 118.0 eggs. This is at the same time as improvements across a wide range of commercial, welfare and robustness traits demonstrating that antagonistically related traits can be improved simultaneously if they are included within a multi-trait breeding goal and balanced selection is applied. ■

Fig. 1. A selection of breeding programme activities for improving turkey breeder performance.



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4. Employee and animal welfare during turkey AI

by IMV Technologies, France. www.imv-technologies.com

Commercial turkey production has significantly increased over the past 10 years. Along with the increase of the number of turkeys produced, the number of welfare issues has also increased. In recent years, various methods to improve both employee and animal welfare in the turkey industry have been developed.

Different techniques are currently used around the world to artificially inseminate turkeys: group pen breeding and open barn breeding with a chair.

PEN BREEDING

This technique is primarily used when groups of turkey hens are housed together in pens.

The inseminator and the catcher must move around the barn from pen to pen. The catcher picks up the hen from the ground and positions her so she is supported between his legs.

The inseminator, who carries the semen doses, bends over to inseminate the hen as the catcher continues to hold her. Using this technique, a team of five people can inseminate around 800 turkeys per hour.

Employees are exposed to three risk factors that can contribute to musculoskeletal disorders (MSDs) when inseminating with this technique:

- **Repetition:** both the catcher and the inseminator repeatedly bend over; the catcher to pick up turkeys and the inseminator to inseminate.
- **Awkward postures:** the hens are free to walk around in their pen; putting the catcher in awkward positions.
- **Forceful exertion:** after 2,400 inseminations, the catcher has lifted over 7.0 tons.

In the turkey industry, MSDs are responsible for a considerable number of employee injuries and periods of sick leave. Therefore, improving staff welfare is a key concern for many managers in the industry. Using more ergonomic processes and techniques could greatly reduce the number and severity of MSD cases.

The use of an AI chair in conjunction with a pit or ramp are two techniques which have been implemented on some turkey farms to improve employees' working conditions.

HOW USING AN AI CHAIR HELPS IMPROVE COMFORT

This method of artificial insemination is used in systems where turkeys are not housed in group pens. The catcher and inseminator do not move between pens, instead the hens are guided to a centrally located area where the catcher and inseminator are positioned. In some production settings, when comparing pen breeding to this method, a slight decrease in productivity (600 inseminations per hour) was noted.

There are two ways to inseminate using an AI chair:

- **Pit:** The catcher is in a pit with access to the hens on one side and the inseminator in a chair on the other side. This setup requires the catcher to repeatedly pass the hens from one side to the other.
- **Ramp:** The catcher stands next to the inseminator's chair and passes the turkeys as they are guided up a ramp. This setup requires the catcher to repeatedly rotate his upper torso and bear some of the weight of the hen during the transfer from the ramp to the chair.

Although both methods eliminate the catcher's need to bend down to pick up the hens and hold them between his knees; the catcher is still exposed to some MSD risk factors. With both methods there is still a need to repeatedly twist from one side to the other. And with the ramp method, the catcher must also support some of the hen's weight during the transfer.

The inseminator's working conditions are improved. He no longer needs to stand, bend over or carry the semen doses during the insemination. However, with this method the inseminator must hold the hen between his legs during the insemination, exposing him to injuries caused by the flapping of wings from the hen.

Gallicomfort optimises both human and animal welfare during insemination.

NEW EQUIPMENT FOR OPTIMUM COMFORT

Inseminators and ergonomic specialists have developed new equipment to improve both human and animal welfare during insemination. The most recent system is Gallicomfort, a bench, which allows the insemination team to work at lifting height. The turkeys are guided up a ramp to the insemination bench. The catchers then transfer the hens, one at a time, at lifting height, to the inseminator by sliding them across the bench's table. Because the catcher can slide the hens across the table, instead of lifting them, the amount of weight lifted after 2,400 inseminations is reduced to 3.5 tons, compared to 7 tons when hens are picked up off the ground.

The design of the bench's table also provides adequate room for the catcher to reposition his feet when sliding the hen across the table. This leads to a reduction in the amount of twisting that occurs during the transfer when compared to AI using a chair in both a pit and ramp setup. The bench also improves the inseminator's working conditions. The addition of an adjustable stool allows the height of the workstation to be adjusted to the employee carrying out the insemination. The stool reduces the inseminator's exposure to prolonged periods of standing, which are often associated with back pain. Furthermore, the incorporation of an ergonomic armrest places the inseminator's hand at the correct height, reducing strain on the shoulder.

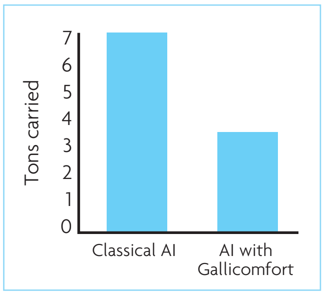

Fig. 1. Results of a study carried out on a turkey farm in Brittany with 2,400 inseminations.

It also allows him to easily guide his arm from the straw filler to the hen for insemination.

By incorporating this system, turkey farms can maintain or improve their productivity levels; a team of five should be able to inseminate 700 turkeys per hour.

Improving employee welfare and maintaining high productivity levels are not the only factors of production that improve. This system also helps improve the turkeys' welfare.

Housing turkeys in small group pens is no longer needed; they are able to move around freely. The handling of the hens is also more controlled. They are slid across a smooth table and placed directly in front of the inseminator. After insemination, they are released to an exit ramp positioned below the bench.

Human and animal welfare are key concerns for today's turkey industry. Equipment and tools are already available to help improve breeders' working conditions, but room is always available for new and enhanced solutions. ■

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5. Lights: How to maximise egg production

by William Guzman, Technical Sales Specialist and Fertility Expert, Hybrid Turkeys. www.resources.hybridturkeys.com

Turkey breeders have used artificial lighting schedules for many years. As new technologies are introduced, along with changes in genetic breeding goals, there are opportunities to utilise lighting to improve overall production even more.

Lighting requirements for turkeys vary throughout their life and are dependent on their physiological needs as well as their role in the protein value chain.

LIGHTING SCHEDULE

Proper control of the light environment will enhance turkey performance when reaching physical maturity and throughout their production cycle. On the first day of placement, it is recommended to give birds 20-22 hours of light so they become familiar with their surroundings and seek out food and water. In the following days and first weeks of life, up to 17 weeks old, it is recommended to mimic natural daylight with approximately 14 hours of light and 10 hours of darkness per day. This will allow plenty of time awake when the birds can seek out feed and water to reach their growth potential during rearing.

The next stage of the lifecycle, from week 17 to 30, is called the conditioning phase. During this time it is recommended to decrease the amount of daylight to six hours per day as a means to condition hens and prepare them for egg production. Egg production is initiated through photo stimulation, generally beginning at 29-30 weeks of age. Photo stimulation is achieved by re-introducing light at longer intervals. When lengthening daylight hours, it is recommended to always add the extra light in the morning.

- Light controlled barns:

Increase day length back to the original length of 14 hours of light. Periodic light increases during the production period, up to a maximum of 17 hours, can help to sustain good egg production. The lengthened day length encourages bird activity, egg production and helps to prevent floor layers.

- Non-light controlled barns:

In curtain-sided barns it is imperative to have the hours of daylight meet or exceed the natural day length, if longer than 14 hours. Once a day length is established in the production phase, you must ensure this length of light remains, even if natural light begins to decrease. This can be accomplished through artificial lighting.

Use of timers is recommended to ensure consistency in the management of day length. Timers should be checked on a regular basis to ensure they are working properly.

LIGHT INTENSITY

Light intensity is measured in LUX or Foot Candles, depending on where you live. Measurements, using a light meter, should always be obtained at bird level to get an applicable reading.

It is recommended that on the day of placement, poults receive light intensity of 100 LUX (10 FC). From approximately day two up to 17 weeks of age, light intensity can drop down to a minimum of 50 LUX (5 FC). When the birds are ready to begin laying, approximately 29-30 weeks of age, the light intensity should rise to a minimum of 100 LUX (10 FC). This higher intensity light should continue until the end of the lay period. Female breeders prefer to lay their eggs in dark or shadowed areas. Therefore, it is recommended that during the lay period, the light intensity is approximately 40-50% less over the nests versus the rest of the barn.

Light intensity from a bulb can decrease over time or can be reduced from dust build up in the barn. Bulbs should be serviced frequently and replaced when necessary to ensure optimum light intensity and coverage.

DISTRIBUTION OF LIGHT

Uniform distribution of light throughout the barn is a key factor in a successful lighting program. When evaluating your barn, whether setting up new lights or looking at your current set up, it is important to consider the angle of light dispersion. There should be no gaps in lighting on the floor. Gaps can be created if lights are spaced too far apart (see Fig. 1). These dark or shadowed areas can increase the risk of broody behaviours which will affect overall flock performance.

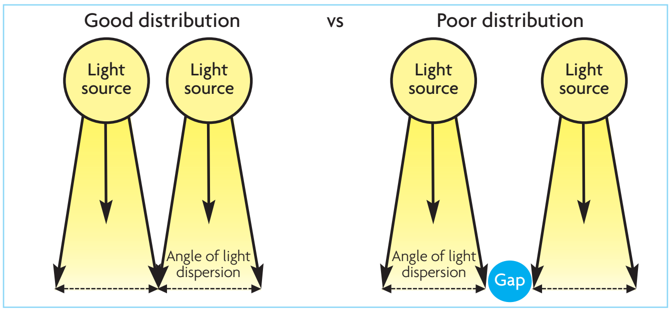


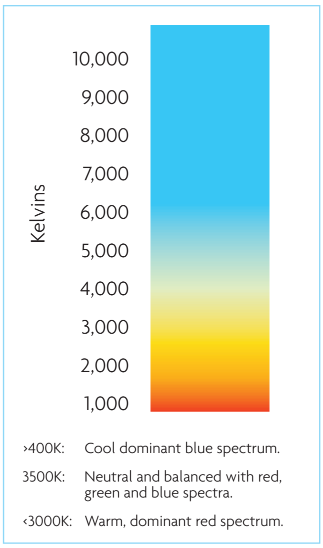
Fig. 1. Distribution of light.

COLOUR SPECTRUM

Colour spectrum is not a new concept in poultry lighting but has come back into the conversation with the introduction of LED lights. The recommended colour spectrum (see Fig. 2), also known as colour temperature, varies based on the role of a turkey in the value chain.

For breeders, the recommended colour spectrum should be between 2700 and 3300 Kelvins. This equals a warm, dominant red temperature that is optimal for development of the reproductive organs.

Fig. 2. Colour spectrum (Dr Susan Watkins).



INSTALLATION OF LIGHTS

It is important to understand that turkeys receive and interpret light differently than humans. Lights can seem perfectly normal to a human eye, however to a turkey, a light that is not installed correctly or that has faulty wiring can produce a flickering effect which can lead to an increase in aggressive behaviour in a flock. Therefore, when updating your lights, it is recommended to check with an electrician to ensure you have proper wiring and dimmers that can handle the newer technology.

SUMMARY

Successful production of turkey eggs is dependent on a variety of factors to ensure a high level of high quality fertile eggs.

In addition to creating a barn environment with appropriate lighting, based on the areas referenced above, do not forget about other essential management factors, including:

- Animal care such as proper handling and applicable flock density.
- Feed and water management to ensure birds are well nourished according to breeder recommendations.
- Air quality management to avoid high levels of gases, extreme temperatures or high humidity levels.
- Sufficient number of nests, based on the number of birds in the flock, to avoid floor eggs.

The best way to ensure all essential factors are in check is to do floor walks throughout the day. ■

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6. Feeding the turkey breeder

by Aviagen Turkeys Ltd, Cheshire, UK. www.aviagenturkeys.com

Breeding companies have made significant strides in improving the genetic capability of modern turkey breeds as part of a balanced breeding programme. Improved weight gain and efficiency of the commercial cross has resulted in increased growth potential with simultaneous improvement of health, welfare, robustness and sustainability.

While these advancements continue to improve production efficiency, the result is a high performing breed whose nutritional and feed management requirements need consideration.

The rearing and laying phases are strongly associated; success in laying is largely determined during the rearing phase. The main objective in rear is to achieve adequate physiological development by growing the birds to the breed bodyweight objective.

Managing the growth of turkey breeder females to a bodyweight profile in rear will lead to better production.

Achievement of the bodyweight objective results in birds that are fit and active and pre-conditioned to respond to light stimulation. Birds also require adequate reserves to support production through natural periods of weight loss at the onset of lay.

Acquiring the right body weight and conditioning prior to lay is dependent on achieving certain key physiological 'events' through the rearing period. These are highlighted in Fig. 1.

Essential organs, cardiovascular, digestive and immune system development is critical by six weeks of age. Provision of a good quality crumb or mini-pellet to support feed consumption in this period is important.

From 6-22 weeks of age the bird continues to develop their skeletal structure as well as feather coverage and musculature. The growth profile of the bird needs to be monitored by weighing birds in this period to ensure bodyweight objectives are achieved and birds are fit for the production period.

The feeding programme should be adapted to meet the flock's bodyweight objective. Heavy flocks should move to the next stage diet sooner, while lighter flocks should be held on the higher protein diet until the bodyweight objective is achieved.

Females need to be in a positive growth status during the last 5-10 weeks of the rearing period so they can respond to light stimulation and meet the rapid changes in the reproductive system at this age.

Females must continue to gain weight every week from 22 to 29/30 weeks. It may be necessary to feed a higher balanced protein density to ensure weight gain occurs. Qualitative feed management is the most effective tool to manage the development of the female turkey breeder. Bodyweight control is achieved by gradual reduction of balanced protein supply to the bird through a series of diets with decreasing levels of protein (see Table 1).

Males must follow a feeding schedule nutritionally matched to their needs and not compromised by following the female regime. Male bodyweight must be managed the same as females with regular monitoring of bodyweight against objective and adjustment of the feeding programme if the birds begin to move away from the bodyweight target.

Following final selection (18-20 weeks) males should be fed diets which enable them to make positive weight gains week on week without becoming overly conditioned. Males transferred to the laying farm at the correct weight will produce more sperm, be easier to handle and have better livability.

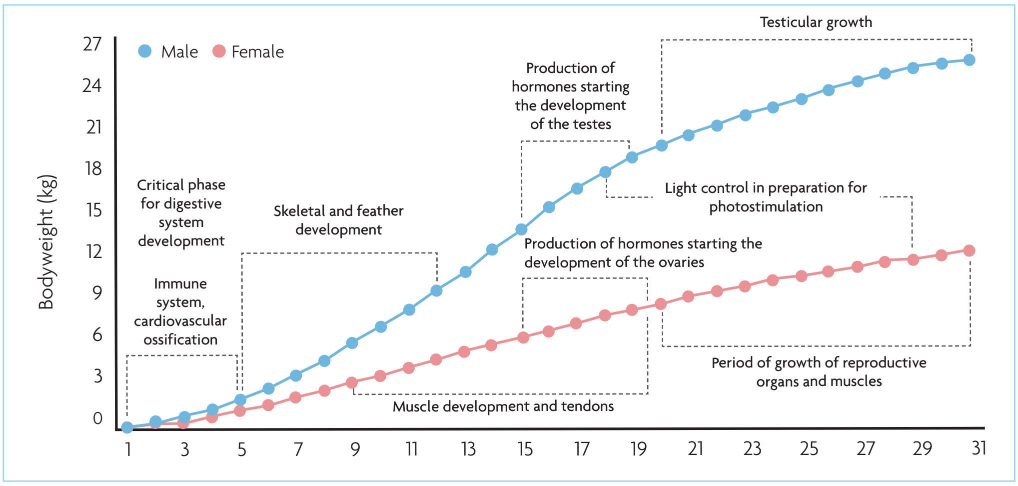
	Starter	Rearer	Grower				Managed male feed	
			1	2	3	4	Quality	Quantity
Protein	25-26	21-23	16-18	12-14	10-12	9-11	9-12	14-15
Energy (Kcals/kg)	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,866
Energy (Mj/kg)	11.6	11.6	11.6	11.6	11.6	11.6	11.6	12.0
Digestible lysine	1.40	1.04	0.81	0.58	0.40	0.25	0.40	0.58
Calcium	1.45	1.35	1.25	1.10	1.00	1.00	1.00	1.00
Available phosphorus	0.73	0.68	0.62	0.55	0.50	0.50	0.50	0.55

Table 1. Summary of nutrient recommendations in rear.

Management of male weights can be achieved by either feeding a low density 'holding diet' fed ad-libitum or by applying quantitative feed management.

Introduce the laying diet at lighting or no more than one week after lighting. This diet needs to be similar in energy level to the rearing diets to ensure bodyweight is supported through the early laying period. Flocks which are performing above target should not be changed to a lower density diet until 15 weeks into lay.

Fig. 1. Physiological development of breeding stock.



SUMMARY

The rearing period is the most important part of the breeder's life and dictates future performance.

Rearing the breeder female is a combination of nutrition and management, a system of monitoring and dynamic reaction to body-weights in rear will achieve the best results. Management of weight development of the breeder is critical to exploit the full genetic potential of modern turkey breeds.

The feeding programme should be used as an adaptable 'tool' by the farm manager to keep the flock to the desired bodyweight profile.

The nutritional needs of the male should be considered separate to the female; this is of particular importance in the early rearing period.

Maturing males benefit from qualitative or quantitative feed management, whilst management of female bodyweight into production is best achieved with qualitative feed management using a range of diet densities ■

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7. Turkey incubation: an art of its own

by Roger Banwell, Petersime Hatchery Development Department. www.petersime.com

The eggs of all avian species follow more or less the same basic rules of incubation. For example: egg weight loss is equally essential for a humming bird egg as it is for an ostrich egg. Besides, getting rid of CO_2 is critical for all growing embryos of all avian species. And of course, no species can be successfully incubated without thermal absorption/dissipation. Does this mean that all species or flock types require the same incubation conditions and we only need to adapt them to variations such as flock age, storage time, storage conditions and so on?

Unfortunately, no. Each species has different sensitivities that we should consider during the incubation process. Besides, the application of these rules already starts before incubation.

Considering egg management as well is extremely important and each species will need a slightly different approach.

SPECIFIC INVESTIGATION

Petersime constantly sets up trials to investigate these 'avian rules'. As for incubation, these rules have resulted in standard incubation programs for turkeys.

These programs for turkeys perform very well, but even a small modification based on your own experience can significantly improve the hatchability, poult quality and poult uniformity.

For many years, the Petersime P13 incubator proved to be an extremely effective incubator. Being especially developed and tested for turkeys, this machine had different dimensions and a different working principle compared to the existing chicken machines.

However, it lacked new technologies such as Embryo-Response Incubation and there was a demand for increased capacities. That is why we took a closer look at the species and carried out several in-house trials in the Petersime laboratory and extensive field trials with external partners.

We investigated all stages of embryo development and the relevance of all environmental elements.

A more uniform temperature bandwidth, a more precise control system and improved ventilation of the new incubator design resulted in identifying several key elements.

KEY ELEMENTS FOR TURKEY INCUBATION

During incubation, we noted that the transition from the endothermic to the exothermic phase for turkey embryos required lower temperatures than other species. This resulted in a specific, standard turkey incubation program.

This improved temperature uniformity also revealed a sensitivity that we have seen with layers too: the thermal transition between setter and hatcher.

Good transfer and hatcher temperatures are critical. While transferring the eggs from the setters to the hatchers, we discovered a poor continuity of shell temperatures inbetween.

A smooth transition plays an important role in terms of hatchability and poult quality. Critical in this situation is the pulsator speed prior and during the hatching process. The transition of the fertile eggs to the hatchers also means a difference in machine airflow. The best match between setter and hatcher airflow is essential and we integrated this in our standard programs.

These sensitivities allow Petersime to offer a much more realistic 'standard incubation program' for turkeys. This program should always be considered as a 'safe' starting point for any hatchery.

Along the way, the hatchery manager can ultimately optimise it to his own specific flocks, breeder stock, production requirements and so on.

EGG STORAGE FOR TURKEY EGGS

A lot of research was done in terms of recovering hatchability during egg storage as well. The principles of giving short periods of incubation during egg storage (SPIDES) have been known for more than 20 years, but the application of it was never straightforward.

The development of the BioStreamer Re-Store with the OvoScan device managing the eggshell temperature as a key parameter in this process seemed to be very effective and resulted in a lot of trials for turkey eggs.

This specific research has shown that turkey embryos at point of lay are much more fragile compared to chicken embryos because the turkey embryos are in an earlier development stage compared to chicken embryos. Because of this, the application of the Re-Store machine has even more benefit for turkey eggs compared to chicken eggs. The application of Re-Store for turkey eggs results in a better hatchability, a higher uniformity and better logistics in the hatchery.

A CHALLENGING SPECIES

In essence, turkey incubation is quite a challenge because turkeys are different from chickens in many aspects.

In our attempt to maximise the overall performance, we need to be far more focused on the specific needs of turkey embryos and poults. Having a maximum performance of your turkey hatchery requires a high level of knowledge and expertise and will incorporate a continuous habit of optimisation.

Getting started with comparative trials will surely help you to identify how certain changes to your incubation profile or hatchery practices can affect your hatchery results. ■