ISA FOCUS

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FOCUS ON SALMONELLA

It is now more than 20 years since the first suspicion arose that intact shell eggs could contain *Salmonella* organisms. Previous to this, *Salmonella* contamination was occasionally found on the egg shell surface. Under some circumstances, this might enter the egg through the pores in the shell. Such contamination was minimized after proper egg washing.

However, it was shown in the late 1980's that internal contamination, specifically with *Salmonella enteritidis* (SE) could occur if the laying hen became infected. Some infections could be transmitted from parent birds to their offspring, but the main source of infection was from the environment. Such infections are asymptomatic. They can be detected only by means of blood testing. Testing of environmental samples is the best way to determine the presence of SE, although such presence does not guarantee that either the hens or the eggs will be contaminated. Considerable research showed that the SE infection was most commonly carried by rodents resident in laying houses. Elimination of the infection from the environment of laying houses is difficult, but possible.

Occasional instances of human infections, resulting from eating contaminated eggs, or foods made from them, created a serious problem for the egg industry.

Elimination of infections from breeding flocks was quickly accomplished and no longer takes place, provided parent flocks are periodically tested. Essentially all pure lines and grandparent flocks are free of all *Salmonellae*.

A variety of voluntary and compulsory strategies were introduced in many jurisdictions to control SE in laying flocks and thus, commercial eggs. These included routine testing of environments, sometimes testing of eggs, (although this is a very inefficient way of determining SE presence), vaccinating layers as is done in the UK and several European countries, and of course routine testing of breeder flocks. When infected flocks or environments are identified, control strategies include slaughtering the flocks, pasteurizing the eggs in the shell or breaking them and pasteurizing the resultant liquid egg products.

As Prof. Martine Bouilanne points out in her article, cooperation of all phases of the industry is essential to a successful SE control program. And the commercial producer is the most important, as well as the greatest threat. Particularly with today's large flock sizes, the risk to the public of receiving a SE positive egg is greatly increased if and when a commercial flock does not follow the approved industry program. The Canadian industry is fortunate in having its supply management system to oversee the SE control strategy. Other bodies, for example the United Egg Producers in the US, play an important role in achieving SE freedom in their respective industries, but few have the degree of control available in Canada.

Common threats in all of the successful strategies include:

- Commitment of all phases of the industry
- Development of agreed step-by-step, HACCP based, control program
- Availability of professional microbiological laboratory services
- Detailed record keeping from a comprehensive testing program
- Honest reporting and rapid response to positive test results

The egg industry has a responsibility to maintain and improve its attention to food safety in all phases of its operations. Nobody knows what the next source of contamination might be, but the existence of good Salmonella control programs will make it much easier to respond to future challenges.

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ISA
A Hendrix Genetics Company

Martine Boulianne

By Martine Boulianne, DMV, PhD, Dip ACPV, Full Professor, Chair in Poultry Research Faculty of Veterinary Medicine, University of Montreal St. Hyacinthe, Quebec, Canada

WHAT MAKES A SALMONELLA ENTERITIDIS CONTROL PROGRAM SUCCESSFUL ?

What are the keys to a successful *Salmonella* Enteritidis (SE) control program? How can a government or an industry achieve such a challenge? Experience from the Canadian province of Quebec has shown us that a few 'pillars' are essential to establishing an efficient food safety program.

1. Code of practice (procedures) to lower the risk of contamination

Routes of transmission for *Salmonella* Enteritidis are well known. Primary breeders are now supplying SE free grandparents and multipliers are working to keep their flocks SE free in order to avoid vertical transmission. More problematic is the horizontal route, since SE can be transmitted via so many vectors e.g., other birds, insects, rodents, feed, contaminated equipment, etc... To avoid cross -contamination between the meat and egg sectors, Quebec hatcheries had no other choice than to specialize in either pullets or broiler chicks, a costly but wise decision.

A national code of practice for the producers developed by the Canadian Egg Marketing Agency and based on HACCP principles, (called "Start Clean-Stay Clean"), was then used as the basis for implementing various control measures. For example, the Quebec producer must contract the services of a professional exterminator to eliminate rodents or any other potential vector from the laying barn. He must obtain proof that his replacement pullets are SE negative. Eggs must be stored daily in a cold room strictly used for storing eggs with a temperature maintained at a constant level of less than 12°C. Furthermore, if mortality is in excess of 1% per month and/or when mortality has increased by more than 0.5% per month, dead birds must be sent to an accredited diagnostic laboratory to verify for the presence of SE. Periodic environmental testing is mandatory.

2. Verification of the efficiency of procedures in the code of practice (testing)

Compliance with the code of practice must be verified at regular intervals, and the program must have 'teeth'. For example, in the Quebec program, eggs from laying flocks which do not meet the above-mentioned conditions will be sent for breaking and pasteurization.

Detection tests for the presence of SE in the flock/barn must be regularly conducted at all levels of production: hatchery, replacement pullets and layers. Regular testing is at the basis of any surveillance program.
Various means of testing have been discussed in the scientific literature, and testing the environment has been shown to be a very good means to determine whether birds may be infected. This can be done with drag swabs/socks when birds are on litter, or by sampling/swabbing various surfaces and/or dust in cage-housed flocks.

Bacteriological analysis must be performed in a certified laboratory, using not only pre-enrichment but also delayed secondary enrichment. This method (sub-culture) has been shown to increase *Salmonella* detection by 7 to 20%. While serotyping all *Salmonella* positive samples to determine the serovar is expensive, all serotype group D are further tested to determine if the sample is indeed SE positive and what is the phage type. For statistical purposes, all salmonella positive samples are serotyped during a one-month sampling period each year.

3. Strong corrective measures following a positive test to prevent any suspected product reaching the consumer

In Quebec, any breeder pullet flock, breeder flock or commercial pullet flock testing positive to SE will be destroyed because of the immense spreading potential from these flocks.
In the case of a group D Salmonella positive sample from a laying flock, eggs are immediately located and seized at the grading station and a second series of tests is conducted. A quick and decisive response is essential to decrease the risk of consumer exposure.
If results are negative, eggs will be sent back to the market but testing will be conducted monthly thereafter.

FOCUS ON

FAMILIES HENDRIX AND GRELIER INVESTIGATE TO JOIN FORCES IN POULTRY BREEDING

On December 29, Hendrix Genetics B.V. and Financière Grelier Holding s.a.s. have agreed an exclusivity period in which they will investigate the possibility to join forces in poultry breeding and distribution.

If this investigation will lead to an agreement and after consultation of the representative bodies of the employees and subject to various necessary consents, it is expected that this will be realized in the middle of 2011.

If results are still positive, the eggs are sent for breaking and pasteurization with a special protocol to handle these SE positive eggs. Hens are prematurely slaughtered to allow for a thorough cleaning and disinfection and empty barn tests. These measures are accompanied by a compensation policy. Having these various interventions performed not only by the industry, but also by the concerned national and provincial governmental agencies makes for a better comprehensive response. Communication plans and the role of the various participants must be clear in order to be rapid, effective and avoid loopholes

4. Compensation program to support stakeholders when they need to apply corrective measures

There must be financial compensation for the producer to cover for his losses and alleviate the fear of adhering to such a surveillance program. Furthermore, logistic support should be provided to help an often overwhelmed producer. The Canadian supply management system for egg production has definitely facilitated the application of such food safety programs. All egg producers pay a levy based on number of layers or the number of eggs produced. This structure offers an ideal basis for an effective communication between members, gives the Boards the means to regulate members and the financial resources to establish an insurance fund for the producers struck with SE.

5. Engaged industry and educated producers

In order to establish and run a successful SE control program, the egg industry must be fully engaged in all steps leading to the creation, implementation and management of the program. This can only be achieved when the most important players, the producers, understand not only that SE is a risk to public health, but also the epidemiology behind such an infection; in other words, how can a hen become infected with SE? With such understanding, compliance to the code of practice will be markedly increased, and collaboration with an emergency response plan will be active.

In conclusion, it is possible to control SE and many organizations in the world-wide egg industry have risen to the challenge.

The next step will probably be the need for the chicken meat sector to develop similar SE control programs since the consumption of chicken is now considered a risk factor associated with SE in humans.

'ISA award of excellence' to Incubadora Mexicana (IMSA)

ISA presented the 'ISA Award of Excellence' to IMSA in recognition of its leadership in the poultry industry, supplying over 50% of the Mexican market with Bovans White and ISA Brown.

From left to right: Frans van Sambeek - Director R & D - ISA, Dave Libertini - Vice President Americas of HG, Gregorio Lopez - ISA Area Manager Mexico & Central America, Dr. Jose Luis Aviles - General Director IMSA, Dr. Raul Ferzuli - Technical & Sales Manager of IMSA.

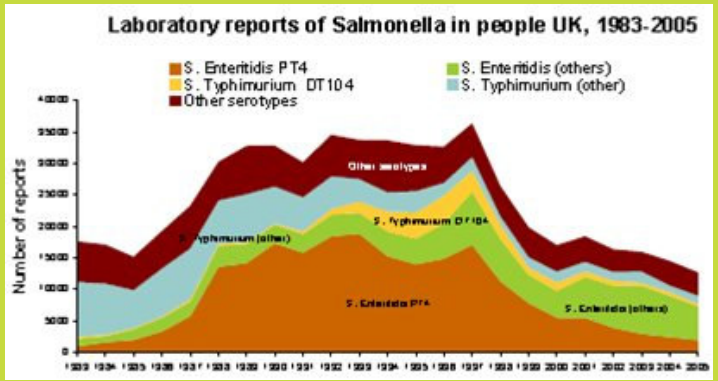
UK EGGS - A PUBLIC HEALTH AND MARKET SUCCESS STORY!

By Mr. Nick Bailey, Managing Director Joice and Hill Poultry Ltd.

In 1988, Health Minster Edwina Curry declared that "most of UK egg production was infected with salmonella". Her comments were disastrous to the egg sector and flocks were slaughtered as consumption dropped through the floor. In truth we did not have a proper epidemiological picture and that year the UK had 30 000 cases of salmonella infection and 60 fatalities. Edwina lost her job and many egg producers undoubtedly burnt effigies of her but 10 years later the egg industry has its house in order and turned a PR disaster into a success story. In 2004 only 8% of UK holdings were positive for salmonella (EFSA report). This continues to fall and by 2009 the figure was just 0.35%. Incidences of all salmonella contamination have fallen by more than two thirds.

The Lion Code

So how did this happen? In 1998 the largest packers re-introduced a quality mark from the 1950s and the Lion Code was born. A new code of practice encompassing hygiene, traceability, bird welfare, *Salmonmella enteritidis* (SE) and latterly *Salmonella typhimurium* (ST) vaccination were introduced. Initially this was mostly inactivated vaccine but later live vaccines were also widely used. The code covers the entire chain from the placement of Parent Stock (PS) chicks to the slaughter of commercial hens at the end of lay and includes regulation of feed mills and packing stations. The Lion is independently audited and today accounts for 90% of UK egg production.



All UK commercial breeding flocks and hatcheries are within the Lion.
PS flocks are not vaccinated against salmonella but closely monitored including sensitive environmental testing during the production period.

Hatcheries are also monitored with hygiene audits every 6 weeks. Weekly testing of meconium samples has now been replaced with testing of hatch basket liners, a sample of which is sealed and sent out with all chick deliveries.
Feed control is a very important aspect of food safety and all mills supplying Lion Code flocks must conform to the UFAS/UKASTA codes of practice. Diets are free from animal proteins and many producers use acids such as Salcurb as added insurance. Breeder diets are mostly heat treated.
Moulting is not allowed and all flocks are tracked on a passport system.

The Lion supports egg sales through the British Egg Information Service and promotes recognition of the brand through advertising. Egg consumption has started to increase again in recent years.

National Control Program

Since 1st January 2009 new EU regulations forbid the sale of eggs from SE and ST infected flocks, unless first heat treated.
A National Control Programme was introduced for each EU country to ensure adherence and monitor progress towards low levels of infection.

The UK industry has, certainly for the past 12 years, consistently argued in favour of scientifically-based and proportionate control measures and has, in partnership with the UK authorities, helped shape the current control system.

All tests are carried out using the highly sensitive MSRV ('Modified Bilthoven') method. It applies to all holdings over 350 hens using the following schedule:

- Breeders. Boot swabs from all houses every 3 weeks.
- Hatchery. Pooled composite sample of hatch basket liners representing all supplying PS flocks plus up to 60 dead on arrival chicks.
- Rearing. For floor rearing boot swabs and for cages composite faeces sample taken at 14 weeks.
- In lay, boot swabs or composite faeces taken every 15 weeks and starting at 22-26 weeks.
- Any isolates are fully identified to serotype and confirmed as either field or vaccinal origin. There is a requirement to ensure that antimicrobial use does not mask infection.

In preliminary EU baseline testing in 2004, the majority of positive sites were multi-age intensive units. These units had the most work to do but between 2004 and 2009 the number of positive holdings fell from 8% to 0.35%.

This shows eradication is possible. It also demonstrates that vaccination alone is no magic bullet to salmonella control as the majority of these units would have been vaccinated throughout this period.

Bio-security was key:

Where possible sites became single age or at least reduced the number of ages.

- Many changed from dry to wet cleaning during house turnaround and introduced strict bio-security protocols such as separate clothing and footwear per house.
- In particular rodent control was a central issue and many producers used specialist advice to eradicate persistent infestations.

In 2009 Edwina Curry wrote in the national press, Twenty years ago last December, I warned the people of the UK, when I was minister for public health, that we had a problem with eggs…..

A decade later, the British egg industry had sorted itself out, spending millions to clean up their act. So, I'm delighted that the latest study shows that eating eggs may be good for you – or at least, no longer bad for you.

Eggs are cheap, nutritious and great with bits of toast. Eat up, say I! Eat up!

Award for Colombiana de Aves (Colaves) Colombia

Mr. Otto Beltran, President of Colaves (on the right) received the award for 10 years of distributing ISA Brown in the Colombian market from Frans van Sambeek, Director R & D - ISA (left) and Otavio Rech, ISA South America sales and Technical Representative (middle).

Interaves Agropecuaria signs a 4 years distribution contract with ISA

For more than 15 years, Interaves Agropecuaria has been an exclusive distributor for Hendrix Genetics products Hisex White and Brown. The signature of this contract shows again the confidence of Interaves / Globoaves in Hisex White and Brown.

From left to right: Mr. Cacio Fracaro - Manager Interaves Agropecuaria, Mr. Roberto Kaefer - CEO of Interaves / Globoaves, Benoît Pelé - Director ISA France and ISA subsidiary companies, Fidel Gonzalez - Area Manager South America, Paulo Roberto Curi - Manager Controller

FOCUS ON

HENDRIX GENETICS TO EXPAND INTO AQUACULTURE BREEDING

On December 9, Hendrix Genetics and Lithgows Limited have signed a Letter of Intent for Hendrix Genetics to acquire Landcatch & LNS (Landcatch Natural Selection) from Lithgows Limited.

This acquisition fits very well with the Hendrix Genetics multi-species breeding strategy, and we look forward to becoming a leading aquaculture breeder, as we have done in turkeys, layers and pigs. With Landcatch and LNS we create a new platform with a new horizon in aquaculture breeding and life sciences".

By Ir. Frans van Sambeek, Director Research & Development of Institut de Sélection Animale

Progress in Layer Genetics
'LONGER PRODUCTION CYCLES FROM A GENETIC PERSPECTIVE'

Introduction

Research and development is the basis of successful and profitable breeding programs for layers. It is also the basis for profitability of our distributors and for the customers of the customers: the poultry farmers. R&D and genetic improvement are the core business of ISA. In all products the main breeding goal is maximum number of saleable eggs per hen housed. This is achieved through selection for long term persistent laying rates, high livability and excellent egg quality.

Developments in the layer business

The layer business is a fast changing business. In 2012, EU producers are compelled to adopt alternative housing systems; standard laying cages will no longer be permitted. In the USA, animal welfare activity is changing the production systems for table eggs. In some countries there is legal pressure on a ban for bird treatments such as beak trimming, de-combing and de-toeing. In many countries there is pressure on increased regulation or outright banning of the use of antibiotics.

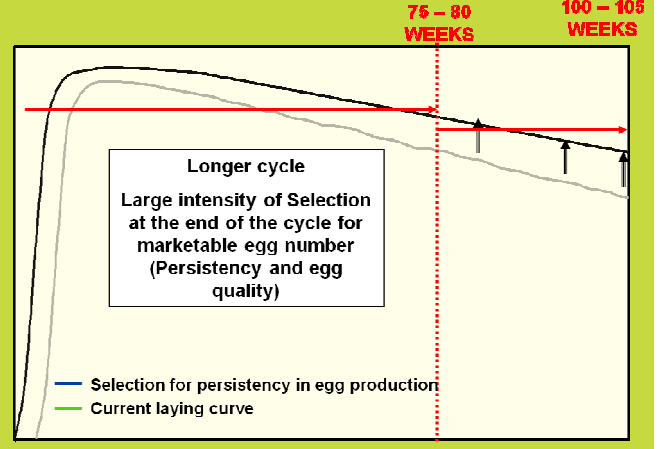


Figure 1 Selection for better laying persisitency until 100 wks of age

Increasingly, there is more emphasis on animal welfare involved with bird management, such as molting adult birds and killing male day old chicks in the layer hatcheries. More by-products such as Distillers' Dried Grains and canola from the bio fuel industry are used as feed ingredients in layer diets. The call for more efficient use of resources continues to increase for feed, water, energy and land; the carbon footprint is becoming important.

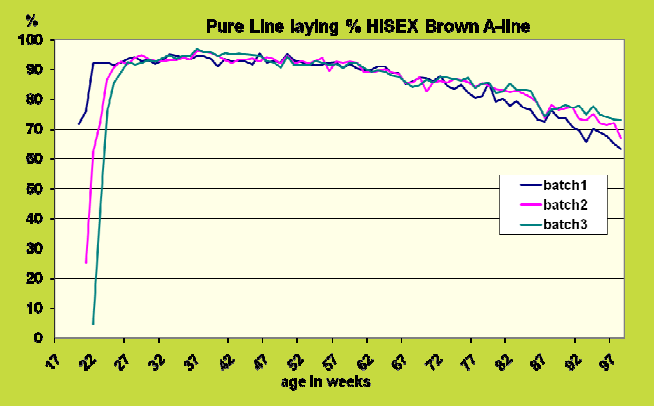


Figure 2. Example of a production curve of a pure line until 100 weeks

In addition, we are seeing longer laying cycles for layer parent stock and commercial layers. During the last few decades the genetic improvement for egg production has been significant. In layer parent stock the genetic improvement was 0.5 to 1.0 day old chicks per breeder per year. This is a combination of genetic improvement and a longer laying cycle, increasing from 64 to 68 weeks, which results in an improvement of 15 – 20 day old chicks per breeder female since the 1980's.

For the commercial layers the genetic improvement is approximately 2.5 eggs per year. Together with the extension of the laying cycle from 68 to 75 weeks of age, this results in 70 more eggs in the last two decades. It is clear that this increase is realized by a combination of improved genetics, management, nutrition and disease prevention. For the next decade ISA expects this development will continue: more genetic improvement and longer production cycles. Around 2020 the parent stock will produce about 120 day old chicks and the commercial layers will produce about 500 eggs in a production cycle of 100 weeks without molting.

The longer production cycle in commercial layers

Currently the brown-egg birds are kept to 80 – 85 weeks and the white-egg birds in some markets to 85 – 90 weeks. Economic, genetic and animal welfare reasons play an important role. Keeping the birds longer will decrease the contribution of the 17 week old pullet to the cost/egg and there is less labor cost for housing and loading the layers. The revenue from the spent hens has decreased over the years and in the near future there will be pressure to forbid molting because of animal welfare issues. From the genetic point of view, the laying persistency of the commercial layers has improved, along with egg shell quality. High peaks of 97% combined with production above 90% until 50 to 60 weeks of age are not an exception. The overall performance of modern layers makes it possible to keep them longer.
The layer business has to realize that because of the higher numbers of eggs per layer and the higher number of day old chicks per female breeder, the number of day old chicks to produce and the number of parent stock to be sold will decrease. This has a big impact on the economics of the egg value chain. A genetic company has to look ahead. The breeding program has to work for the future environment; therefore ISA has adapted its breeding program to the longer production cycles.

The breeding goals and genetic trends

For layers the number of eggs produced is the main trait, but there are many more to select for. In general for all products, egg size and body weight are already optimized, so no big changes are to be expected. The goal is breeding birds with a genetically more flat egg size curve. There is high selection pressure on several egg quality traits such as shell strength, shell surface properties, shell color and internal egg quality. Genetic improvement of feed conversion takes place through additional egg mass output, and not through decreasing feed intake. The goal is to breed birds that are able to produce efficiently in different environmental circumstances, including hot climates.

Because livability is an important trait, it receives continuous high selection pressure. This takes place through basic research (i.e. in the field of genomic selection) and field testing (such as Recurrent Testing in different environments). Because the strategy is to have a balanced focus on parent stock and final product traits, there is room reserved for selection on parent traits such as hatchability and chick quality.
Next to these, selection for egg production is the most important. In most products there is no selection for increased early maturity. Peak production is already very high, so only minimal improvement can be expected. There has been and is a major selection focus on egg laying persistency, over the past several years. High peaks with production above 90% for many weeks are the result. This holds true for both commercial and parent stock.

Selection for 500 eggs in 100 weeks cycles

In order to further improve the number of saleable eggs per hen housed, we need selection for laying persistency, livability and egg quality. Therefor SA has added pure line breeding capacity. With this increased selection capacity, the pure line hens are kept until 100 weeks of age. The goal is to breed layers that produce 500 eggs in 100 weeks of age, without molting. In Figure 1 the longer production cycle is explained to increase the laying persistence. Many extra measurements are implemented between 75 and 100 weeks of age. Figure 2 shows an example of the production curve of a pure line in the R&D farms. The pure line consists of 3 different ages. The line shows excellent performance with production above 90% until 65 weeks of age. But it is also clear that the production after 75 weeks can still be improved.

Figure 3 shows the distribution of the number of eggs produced by individual hens to 100 weeks of age. It shows that there are already pure line birds that produce 500 eggs by 100 weeks of age. The frequency is still relatively small and the goal is to increase this percentage.

ISA will achieve its goals through the regular measuring and breeding of pure line birds and recurrent test birds assisted by new technology. An example of new technology is shown in Figure 4, genomic selection.

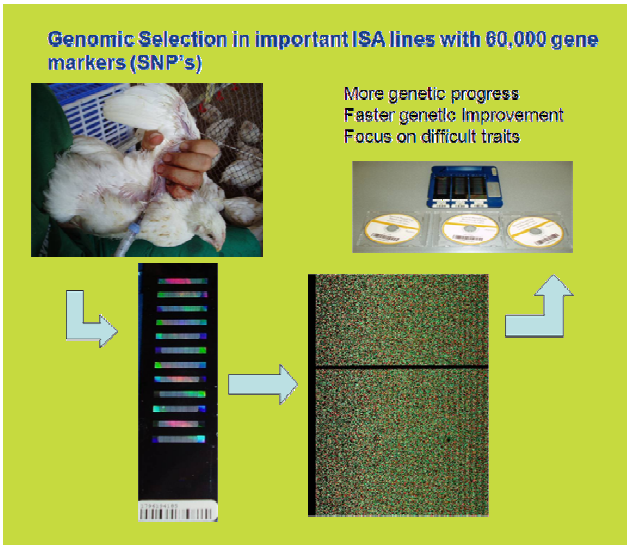


Figure 4. Genomic selection in ISA breeding program

Through DNA research with a 60.000 SNP chip, breeding values will be estimated more accurately. Because laying cycles get longer there is a tendency for the generation interval to increase. This is a disadvantage because it reduces the annual rate of genetic improvement. However, through genomic selection the generation interval can be progressively reduced.

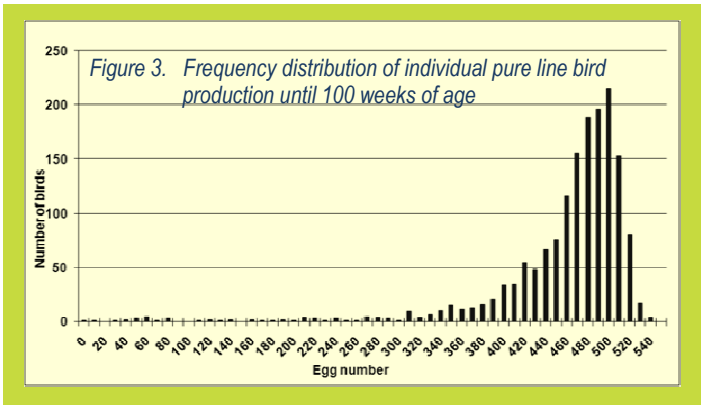


Figure 3. Frequency distribution of individual pure line bird production until 100 weeks of age

Conclusion

ISA has the breeding program in place to further improve the laying persistency and the egg quality at the end of the laying cycle. ISA is ready for the future developments of longer laying cycles.

Institut de Sélection Animale B.V.
Villa 'de Körver'
Spoorstraat 69
P.O. Box 114
5830 AC Boxmeer
The Netherlands
T +31 485 319 111
F +32 485 319 112
E info.isa@hendrix-genetics.com
www.isapoultry.com

INFORMATION

Editorial Team

Peter Hunton
Poultry Consultant and past President, World's Poultry Science Association

Arian Groot
Director Marketing & Sales

Nels Koppes
Marketing Assistant

The editorial team can be reached at:
Isa.focus@hendrix-genetics.com

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WWW.ISAPOULTRY.COM