Strategies for greater robustness and laying persistency

In a commercial environment, where concerns over animal welfare and the environment are as important as an increasing need for efficiency, we must set new goals – new goals for breeding as well as feeding laying hens. Goals for robustness in birds are being called for to improve animal health and welfare through genetic selection.

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However, robustness can also be supported by nutritional approaches designed to promote the adaptive capacity of hens. Commercial trials in layer breeding hens have shown that this nutritional strategy leads to improved laying persistency.

Why robustness matters

The combination of breeding for increased production and the intensification of housing conditions for laying hens have not been without consequences.

Concerns about animal welfare, as well as risks to human health arising from antibiotic-resistant bacteria and disease outbreaks, are paving the way to a new research focus and the introduction of robustness or resilience as a desirable trait in animal production.

The concept of robustness includes individual traits of an animal that are relevant for health and welfare. According to Knap (2012), robustness is the ability to combine a high production potential with resilience to stressors. Robustness is based on the possibility to respond adequately to a stressor and is aiming at less disturbed functioning if challenged with a stressor.

This leads to a competitive advantage, because maladaptation due to stressors can have negative impacts on animal behaviour, metabolism and immunology. Hence, why robustness is rapidly gaining importance in animal production.

The main characteristics important for robustness of production animals are productivity and the capacity to adapt to a wide variety of conditions. Differences in conditions can be due to climate, housing facilities, disease pressure, exposure to pathogens and differences in feed quality and composition.

In this context adaptation can be described as a mechanism of the animal that empowers it to cope with internal or external disturbances, stressors or with changes in the environment.

According to a research group at Wageningen University, a multi-disciplinary approach is crucial to reveal the determinants of adaptive capacity in farm animals. Adaptive capacity is determined by

the genetic background of the bird. However, expression of adaptive capacity, and therefore robustness, can be supported or inhibited by the actual conditions the birds live in (for example nutritional status, social environment, disease pressure, etc).

Breeding for robustness

Research findings have indicated that an animal's welfare is dependent on its genetic characteristics, environmental factors and genetic-environmental interactions. This means an animal has the capacity to adapt to its environment.

Breeding programs that ensure that animal well-being will improve, while at the same time improving production traits, are multi-level and multi-trait selection, directed at improving associative effects.

Research also showed that group selection increases robustness as indicated by the overall greater ability to cope with stressors.

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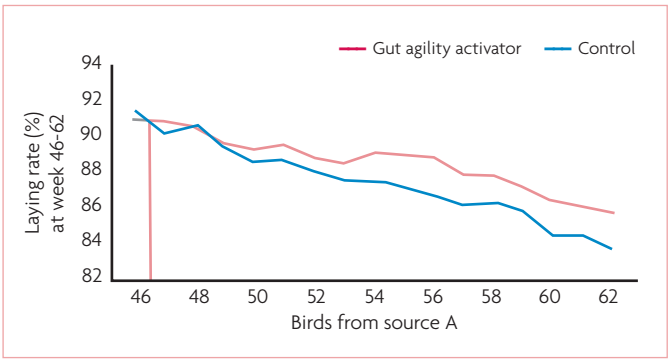
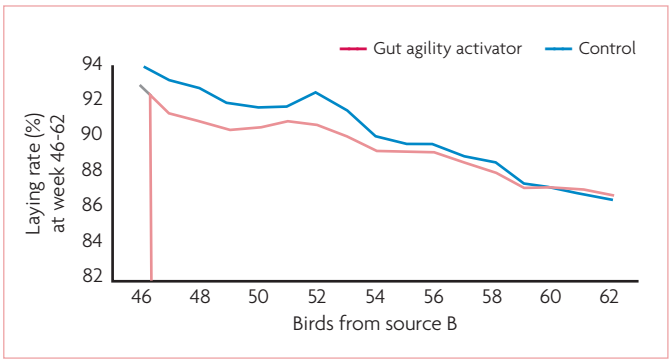
Fig. 1. Laying persistence in commercial layer parents in response to a gut agility activator during the late laying period. Birds from source A located in Hall 2 (Gut agility activator) and Hall 3 (Control), birds from source B located in Hall 6 (Gut agility activator) and Hall 5 (Control).





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For instance, group selected laying hens had a lower mortality in response to heat exposure in multiple-hen cages compared to the control. This suggests that group selection can be an effective method to increase robustness in laying hens.

Genomic selection, based on dense genetic markers, will allow for more rapid improvement of traits that are expensive or more difficult to measure, or have a low heritability such as pecking, disease resistance, robustness and bone strength.

Feeding for robustness

Effective implementation of robustness into a breeding goal requires large scale genetic research, which for most traits is labour intensive and expensive. Therefore, finding additional ways of improving the adaptive capacity of birds, could speed up the process of reaching the goal for robustness in birds.

New nutritional concepts, such as gut agility activators, are designed to support the adaptive capacity and hence robustness of the bird by nutritional means.

They help the bird to adapt to nutritional challenges by minimising stress reactions such as oxidative stress and reduced feed intake, that would otherwise impact performance, health and wellbeing of the bird. Heat stress, high stocking density and mycotoxins are known factors which normally lead to increased oxidative stress and a reduction in feed intake.

Agile birds and laying persistency

Longer laying cycles can help to cut costs, so they are imperative in a tough economic climate. Plus, they can reduce the environmental impact of egg production. Therefore, there is an increasing focus on improving laying persistence and egg quality at the end of the laying cycle.

Poor bird health and environmental stress affect egg formation and the ability of the hen to maintain persistency. This can be aggravated by nutritional stressors in the diet, such as dietary changes, reduced nutrient digestibility, endotoxins, antinutritional factors and mycotoxins. Managing the resilience in birds to those stressors by nutritional means can help to support a better laying persistency.

Adding a gut agility activator, designed to minimise common stress reactions in birds, to the diet of a commercial parent layer flock has been shown to improve laying persistency in the late laying period (Fig. 1).

This indicates that supporting the adaptive capacity or agility of birds with a gut agility activator improves the chance to maintain laying persistency for longer.

More rapid progress anticipated

So far it has been difficult to quantify robustness directly. However, measurements from wearable sensors and other sources together with the emergence of novel analytical tools may become a game changer for measuring robustness.

The livestock industry is already taking advantage of wearable sensors with multiple uses ranging from stress detection, behaviour analysis, physiological monitoring and detecting health and disease status of animals.

A barrier to wearable sensors in the poultry industry is the number of birds that are managed on large poultry operations, as fitting every bird with sensory devices is impracticable. Despite this fact, fitting a proportion of the flock with sensors is possible, and the data generated from these birds can be used to assess total flock health.

These tools are likely to enable rapid progress for the management of robustness in farm animals and may also invite rethinking of how we can support and increase the adaptive capacity of laying hens.

Nevertheless, regardless of the goals we set and the technologies we use to achieve them, success will depend on the economic value. Therefore, they also need to be seen in the context of efficient production at competitive cost. ■