

Better measurements, better selection

I.C. Dunn

Roslin Institute and Royal (Dick) School of Veterinary Studies, Roslin, Midlothian EH25 9PS, Scotland.

* Correspondence: Ian.Dunn@roslin.ed.ac.uk

Abbreviated title: Selection for egg quality

Summary

The benefits of selection for better egg quality are large. New technologies in genetic selection open new possibilities in the development of methods to select hens for better egg quality. We will examine how the EU funded projects SABRE and RESCAPE have tried to rise to these opportunities. In the longer term an integrated approach to egg quality will yield important advances as well as interesting biological challenges .

Keywords: Genetic selection, egg shell quality, antimicrobial activity

Introduction

There are substantial economic, environmental and food safety benefits from improving the external and internal quality of eggs. Declining egg quality as hens age is the principle reason that flocks are culled. If quality and safety can be maintained over a longer production period the reduction in inputs and waste over the whole production cycle are large.

Genetic improvements are cumulative and permanent, but unless you can measure the traits you cannot improve them. There are major developments in the field of genetics and genomics which are capable of delivering a change in the way selection of pedigree hens could be carried out in the future, so called genome wide selection. The affordability and scale of genotyping and the methods to use such large amounts of data means that breeders may be able to use large scale genotyping of molecular markers to aid selection. However this sets new challenges for the research community. However, the priorities I believe remain the same. There is an increased need to understand the traits associated with egg quality and to be able to measure the most important traits if the advances in genetic and genomic technology are to be realised.

Methods

In EC funded projects, SABRE and RESCAPE a consortium of European partners including MTT, Finland; INRA, France; Roslin and Glasgow University, Scotland ; Granada University, Spain working with Lohmann and Hendrix aim to deliver genetic improvement for both external and internal traits, specifically aspects of shell, cuticle and antimicrobial activity. Two principle approaches have been taken; 1) to look at the potential of new measurements that better define the quality traits, 2) to discover genomic loci which underlie variation in the novel and traditional quality traits. The novel measurements aim to dissect the underlying components of quality, for example the crystal structure of the shell, the variation in antimicrobial proteins in egg white or the coverage of the egg shell by cuticle. If these traits are difficult to measure they may be used indirectly via genome wide selection, crosses or association studies to identify genetic markers for use in selection. Those methods that are easier to perform may be used directly. In SABRE and RESCAPE we are using the new genotyping technology to discover genomic loci which are responsible for variation in egg quality to deliver useable markers.

Conclusion

Although these technologies can improve selection and some of these have already yielded potentially useable results there is much more that can be achieved. I believe ultimately we must aim to understand the systems which produce the egg components and how they interact. We must in turn understand the key components of the system that determine variation in egg quality if we are to improve selection of hens for better eggs.

This work was funded by the EU (SABRE Project No 016250 and RESCAPE Project No 036018).