

## Sex selection in layer chickens

Differentiating between males and females pre-hatch, by adding a biological marker to the sex chromosome, is a new gene technology set to impact the poultry industry.

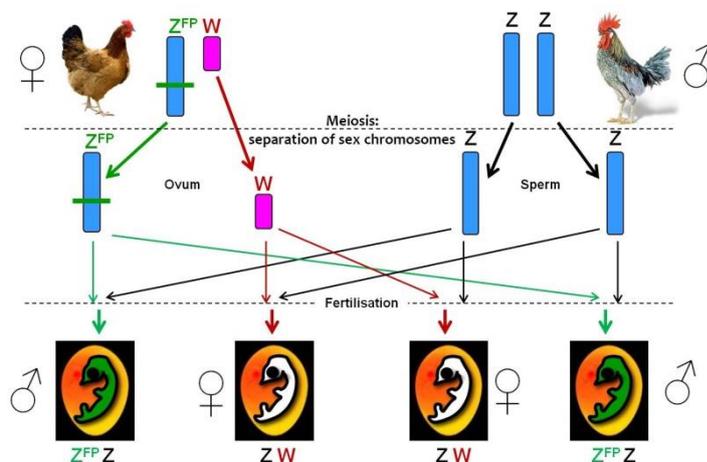
### A new approach to sex selection

Recognising the potential of gene editing technology for selecting female layer chicks pre-hatch by removing male eggs carrying a marker gene was certainly one of those eureka moments. Thanks to recent advancements in gene technology, it is now possible for scientists to specifically place a biological marker on the sex determining chromosome of the chicken. This discovery provides a simple solution to meet a pressing need for the industry and a leading opportunity for the adoption of biotechnology in animal agriculture. Being male or female is determined by sex chromosomes, both in humans and in chickens. By harnessing technology to mark the sex determining chromosome in chickens, the males can be identified before hatching and removed during the incubation. The process uses a gene that marks only the chromosome that says “become male”, resulting in only the male chickens being marked and the females not. The unmarked females go on to lay eggs for our plate.

### How does it work?

The technology used for the sex selection process builds on ten years of experience with chicken genome engineering and gene editing. The skills for the job were developed in collaboration with industry and university partners. The process of marking the sex chromosome starts by carefully opening the shell of a fertilised egg to expose the embryo. A snippet of DNA that encodes for the marker gene, known as green fluorescent protein (GFP) is then microinjected into the bloodstream and taken up by germ cells that go on to become the ovum and the sperm of the adult chicken. Once in these cells the DNA homes in on the sex chromosome and uses a precise ‘cut and paste’

process to lock into this specific target. Male eggs that carry the marker gene make the GFP which can be seen and then detected through the shell using UV light.



### Opportunity for industry

The ability to detect and remove male chicks pre-hatch would be a big step forward to the egg laying and related industries. Currently culling male chicks post-hatch creates a major ethical dilemma for some countries. As a result the poultry industry has invested in developing solutions for this issue. Recently in the USA the United Egg Producers announced its intention to phase out culling of male chicks by 2020 or before if a suitable solution can be adopted. Growing male layer chicks is not a sustainable option for farmers. Sex selection effectively negates the need to cull or grow out male chickens and contributes to a more sustainable industry with a view to future food security. An added benefit is the potential to direct the marked male eggs for other valuable applications such as human influenza vaccine production. This new technology can be automated and integrated into existing farming practises potentially making it easy for industry to adopt.

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