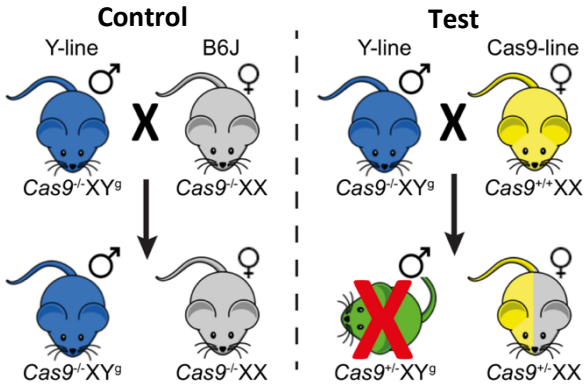
Male or female progeny: now you can choose.

Ido Yosef and colleagues addressed the question of single-sex offspring. Before you dread the end of men or women, this is already a common practice in many fields. When thinking about it, from early civilization times, humans have been preferentially selecting one sex over the other, both in animal and plant production. In the dairy industry, only cows produce milk so the females are preferred. In the poultry industry, males are immediately killed since they offer no economic value, and even in marijuana production where feminized seeds are preferred for their higher tetrahydrocannabinol (THC) content.

Currently, technologies for sex biasing are already being used. This is the case of hormonal feminization of males in plants and sexed semen in domesticated livestock. However, these methodologies are expensive, have variable efficacy and low fertility rates. Furthermore, genetic manipulation of mammals has been shown to lead to infertile parents, so new methodologies are needed.



Strategy used for a female-only offspring production (Yosef, I. *et al* 2019).

In the dawn of the revolutionary gene editing technique CRISPR-Cas9, the authors saw an opportunity. Using mice, an extremely common model for scientific research, the authors developed a technique as a proof of concept for biasing the sex of the offspring during the embryo development while maintaining fertile parents. In order to produce an all-female offspring, they used a female line that encoded the Cas9 enzyme (Cas9-line), an enzyme that can cut DNA with extreme precision, and a male line (Y-line) that encoded three CRISPR guide RNAs which targeted three essential genes for early development in mouse (Y-line). These guide RNAs have the ability to block the expression of the target genes and stop the development of male embryos. The next step was to cross these two lines, in parallel with a control where Y-line males were crossed with normal mice females (B6J line) and evaluate the proportion of males and females in the offspring. As main results, in the control they found a proportion of 23:14 live males to females. In contrast, for the test crossing, they found a very promising proportion of 3:20 live males to females. After DNA sequencing of the three targeted genes of the surviving males, the authors found that only two genes were disrupted, and suggested that this could be delaying lethality, so maybe three genes are not enough for the desired outcome.

This strategy has yet to be polished in order to proof that this outcome is sustained even for an only male offspring production and to guarantee no births of the undesired sex. However, the authors were very successful in showing a simple and economically more viable strategy to produce single-sex offspring.