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Genetically Engineered Hens Made to Kill Their Own Chicks

Analysis by Dr. Joseph Mercola ✔ Fact Checked | June 15, 2022

STORY AT-A-GLANCE

- Each year, more than 6 billion male chicks are killed worldwide, up to 300 million of them in the U.S., as part of the industrialized egg industry
- A team of Israeli scientists have filed a concept patent that involves genetically engineering hens to pass on a lethality, or killer, gene to male embryos, which would eliminate them before they hatch
- Once the eggs are laid, blue light would then be used to activate the lethality gene and kill all of the male embryos in-ovo, or in the egg
- This will likely be presented as a more "humane" approach, but it comes with significant risks, including to the hen, because the lethality gene is likely to produce highly toxic protein that could make the hen sick
- The European Commission stated that such GE hens and their eggs would not be classified as genetically modified organisms (GMOs) and therefore would exist outside of the EU's GMO regulations

One of the atrocities of industrialized agriculture is the egg industry's killing of male chicks. Each year, more than 6 billion male chicks are killed worldwide, up to 300 million of them in the U.S.[1] The reasoning behind this abhorrent practice is at the root of what is wrong with corporate agriculture — egg-laying hens are bred to lay eggs, and nothing more.

Because males cannot produce eggs, and don't grow enough meat to make them useful for human consumption (as opposed to broiler chickens, bred to grow unnaturally large), they would cost more to raise than they would be "worth." With complete disregard for life, egg producers therefore "cull" the males, or kill them off, shortly after birth, sending them to be used as pet feed, livestock feed or simply filler for landfills.

A team of Israeli scientists has now filed a concept patent that involves genetically engineering hens to pass on a lethality, or killer, gene to male embryos, which would eliminate them before they hatch.[2] While it's clear that the practice of killing male chicks must end, this biotech "solution" could end up creating far more problems than it solves.

GE Hens Pass on Lethal Gene to Male Embryos

The patent, which was filed with the State of Israel Ministry of Agriculture & Rural Development listed as the applicant, and Yuval Cinnamon and Enbal Ben-Tal Cohen as the inventors,[3] uses the gene-editing tool CRISPR, or Clustered Regularly Interspaced Short Palindromic Repeat, to insert a foreign gene — the lethality gene — into the male sex Z chromosome.[4]

The genetically engineered (GE) hen would pass the lethality gene — which is supposed to only be activated by blue light — onto all male embryos. Once the eggs are laid, blue light would then be used to activate the lethality gene and kill all of the male embryos in-ovo, or in the egg.

This will likely be presented as a more "humane" approach, but it comes with significant risks, including to the hen, because the lethality gene is likely to produce highly toxic protein. According to GM Watch:[5]

> *"In order to ensure reliable killing of the male chick embryos at an early stage of their development, the lethality gene that the developers insert will have to be highly toxic.*
>
> *The various lethality-inducing proteins mentioned in the patent that are supposed to work by inhibiting growth/development (paragraphs 0156, 0157) or*

essential signalling pathways, such as "bone morphogenetic protein antagonist" or "RNA-guided DNA endonuclease enzyme" (paragraphs 0159, 0160), may be too uncertain in their effects.

Therefore the developer will almost certainly choose to use a known highly toxic element — such as genes encoding for diphtheria toxin or ricin toxin, both of which are specifically mentioned in paragraph 0158 as possible candidates for the lethal gene.

The fact that the authors illustrate their concept using a diphtheria toxin lethality gene, albeit within the context of in vitro tissue culture cell experiments (Figure 24A), supports this line of thinking."

Further, the patent does not restrict the lethal gene to the types named, which means the scientists could use virtually anything, such as a gene encoding cholera toxin.

The Lethality Gene May Be 'Leaky'

Aside from the problems inherent with introducing a lethal gene into a living species is the topic of its blue light activation. The lethal gene is supposed to remain dormant until blue light exposure, but there's a chance it could still exert some level of toxicity even while in this inactive state. This "leaky" lethal gene could have implications for animal welfare and could pose a risk to the mother hens.

GM Watch explained, "It is common experience and knowledge that all transgenic systems are leaky — it's only a question of degree," adding:[6]

"This raises the question of how "tight" and foolproof the expression of the lethality gene cassette is — in other words, whether it is completely silent as desired until activation by blue light illumination, or whether there is some low but significant expression prior to blue light illumination. Indeed, evidence of lethality gene expression leakiness is provided in Figure 13 of the patent (upper panels).

… Thus the optogenic (blue light) activation system linked to the lethality gene cassette will almost certainly be "leaky". This means that in the female founder breeding hens, even in the absence of blue light, the lethal gene may not be silent. So these female founder breeding hens and their egg-laying female offspring could express the lethality gene at a low level.

This would mean that these hens would be producing a lethal toxin inside their bodies. As a result they could suffer health problems.

This possibility (which is far from unlikely) raises welfare questions about the health of the female founder hens and their female offspring. Their health status will depend on the nature of the lethality gene and to what extent it expresses in their bodies."

EU States the GE Hens Would Not Be GMOs

As it stands, the patent only represents a proof-of-concept based on in vitro and in ovo trials. A GE hen that passes a lethal gene onto its male offspring is not yet in existence, and the data revealed in the patent only show separate components of the plan, and that it could, in theory work, but the concept has yet to be brought to fruition.

Still, the researchers are hoping to take the project to the next step and have already earned support from the European Commission, which stated that such GE hens and their eggs would not be classified as genetically modified organisms (GMOs) and therefore would exist outside of the EU's GMO regulations.[7]

According to the commission, the definition for GMOs refers to organisms "in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination."[8]

Even though the patent's concept does not occur in nature, the EU responded, "This does not seem to be the case of the layer hens in question, based on the provided information, according to which the transgene is only conveyed to the male embryos, not to the female embryos that develop into these layer hens."[9]

They then reasoned that, since the GE hens would not be considered GMOs under their definition, the altered eggs that they lay would not be, either. "As a result," they noted, "the layer hens in question and their eggs would not need an authorization …"[10] Because the patent does not offer proof that the GE hens are free from unnatural alterations, GM Watch believes the Commission's statement that the hens would not be classified as GMOs is illegal.

History has already shown that it's more than likely that fragments of the lethality gene could end up in unintended places, outside of the Z chromosome, on chromosomes that could end up in female chicks, for instance.

"There appears to be no published evidence showing that this procedure does not give rise to inadvertent transgene fragment integration and that the resulting transgenic founder hens and their female offspring are free from such foreign DNA," GM Watch noted.[11]

So-called "off-target" effects are a known outcome of CRISPR technology, including CRISPR-Cas9, which is supposed to be even more precise than the original technology. One study searched for unintended mutations, based on a separate study that used CRISPR-Cas9 to restore sight in blind mice by correcting a genetic mutation. The researchers sequenced the entire genome of the CRISPR-edited mice to search for mutations.

In addition to the intended genetic edit, they found more than 100 additional deletions and insertions along with more than 1,500 single-nucleotide mutations,[12] showing that genetic edits rarely occur in isolation.

Ethical Issues Cannot Be Ignored

Biotech researchers will undoubtedly try to paint these GE hens that pass a lethal gene to their male offspring as a more humane option than killing baby chicks after they hatch. Targeting genes intended to ease animal suffering has become a common tactic by biotech firms, which believe it may soften regulators and consumers who are wary of

the technology.[13] But the resulting ethical issues remain and are equally disturbing. As GM Watch explained:[14]

> *"This is a major ethical issue, beginning with the action of genetically engineering a mother hen to pass a killer gene to all her male offspring. The lethal toxin-generating gene could escape into the environment or into bacteria. If it gets into bacteria, it could transfer from the bacteria into people or animals, with potentially serious consequences to their health.*
>
> *Any male embryos that are killed using a toxic lethality gene will need to be treated as toxic waste and could not be used, for example, as animal feed, which is the usual destination for rejected male embryos or chicks in the non-GMO egg industry."*

GE Chickens and Cattle Are Already Here

While GE hens capable of passing on lethality genes are not yet a reality, other types of GE chicken have already been created. Scientists have used CRISPR to create chickens that are resistant to the bird flu, which spreads rapidly among CAFO (concentrated animal feeding operation) birds.[15]

The simplest way to stop the widespread transmission of bird flu would be to change the way chickens are raised, putting them outdoors on pasture as opposed to crowded in disease-ridden CAFOs, however. Likewise, the need to create GE hens that pass on genes to kill their male chicks would also be negated by an overhaul of the industrialized food system.

Using heritage breeds of poultry, some regenerative farmers are raising poultry differently. Although the breeds produce fewer eggs and get bigger more slowly than modern breeds, they're healthier and more productive in the long term. Male chicks are not killed upon hatching but, rather, are raised to maturity.[16]

Other GE chickens have also been created, including birds resistant to avian leukosis virus, another disease that plagues CAFO poultry.[17,18] It should be noted that foods

produced via gene-editing are not subject to regulation by the U.S. Department of Agriculture — although an advisory board recommended gene-edited foods could not be labeled organic — or other regulatory agencies.[19]

In fact, in March 2018, the USDA released a statement noting that it would not regulate CRISPR-edited crops, stating, "With this approach, USDA seeks to allow innovation when there is no risk present."[20] Further, in as little as two years, Americans could be biting into their first gene-edited burgers, courtesy of the U.S. Food and Drug Administration's regulatory clearance of gene-edited cattle.[21]

While a lengthy approval process is typically necessary for gene-edited animals to enter the food market, the FDA streamlined the process for gene-edited cattle, allowing them to skirt the regular approval process. The animals, created by bioengineering company Recombinetics, have genes modified to make their coats shorter and slicker, which is intended to help them better withstand heat stress, allowing them to gain more weight and increase the efficiency of meat production.[22]

It's possible that "CRISPR chicken" could follow a similar pathway and end up in supermarkets before long-term safety and toxicity studies have been conducted. For now, the best way to avoid gene-edited foods is to purchase organic and, even better, biodynamic foods from a local farmer you know and trust.

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