BeeLife
European Beekeeping Coordination

Phone: +32 (0) 486 973 920
Email: info@bee-life.eu
Address: Avenue Louise 209/7
1050 Brussels, Belgium.

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Subject: BeeLife Statement on Biotechnology Developments in Animal Agriculture to European Food Safety Authority (EFSA) - Public Consultation PC-1293

Objectives and Purpose

The European Commission has tasked the European Food Safety Authority (EFSA) with providing a scientific opinion on emerging developments in biotechnology, including synthetic biology and new genomic techniques. The scope of this opinion pertains to animals that are currently, or are near-market, for food, feed, and other agricultural purposes. The analysis encompasses the evaluation of risk assessment methodologies, as well as the adequacy of EFSA's existing guidance documents, covering key aspects such as molecular characterisation, food and feed safety, animal health and welfare, and environmental impact.

Honey bees, as well as other potential pollinators, already on the market for pollination services, are included.

Legal Framework

The scientific opinion being developed by EFSA primarily addresses farmed animals, mammals, birds, fish, and invertebrates bred for food, feed, and other agricultural uses. It is also important to clarify that animals bred solely for medical purposes or gene drive applications fall outside the scope of this mandate. The NGT animals identified in the EFSA's knowledge-gathering report are categorised based on their stage of (pre-)market development, which is a crucial factor in evaluating the potential risks and benefits associated with these biotechnological innovations.

Our position

BeeLife is an advocate for evidence-based science and policy, and we recognise that CRISPR/Cas9 and similar technologies have the potential to deepen our understanding of animal physiology and development. Nevertheless, it is imperative to acknowledge that, from the outset, there has been significant reluctance from society[1] regarding the application of genetic modification to animals; the same is valid for the beekeeping community. BeeLife urges co-legislators and evaluators to carefully consider that there is limited, if any, societal acceptance of genetically modified (GM) animals, which should be a central consideration in the regulatory process.

MORE ON OUR POSITION: The founding treaty of the European Union is based on several principles, namely the **Precautionary Principle** (Article 191 TFEU), the **Sustainable Development** (Article 3(3) TEU), the **High Level of Protection** (Article 114 TFEU and Article 191 TFEU), the **Integration Principle** (Article 11 TFEU) and the Rule of law: (Article 2 TEU), that would be violated if synthetic organisms would access our fields and diets without any control. For this reason, any synthetic organism generated by whatever technique needs to follow risk assessment, control and traceability. This is important to ensure the implementation of coherent legislation with the EU's founding principles.

Context and Impacts in the Beekeeping Sector

Honey bee genetic engineering was first recorded in 2014 *(Schulte et al., 2014),* followed by later work by Otte et al. (2018). Schulte et al. (2014) used piggyBac-derived cassettes to manipulate gene functions in Honey bees with high success (20%-27%) transgenic marker expression rates.

To date, few studies have been successful in utilising the CRISPR/Cas9 tool to engineer honey bees *(Kohno et al., 2016, Değirmenci et al.,*

[1] Psychological investigations have suggested that GM animals are viewed as less acceptable than GM plants and that people's sense of ethics has a more significant effect on the acceptance than other factors such as the perceived risks, the recognized benefits, or the trust in regulators and researchers (Zechendorf, 1994; Siegrist, 2000). Cited in Ishii 2017, https://academic.oup.com/af/article/7/2/24/4638829#

2020, Hu et al., 2019, Cheng et al., 2023, Roth et al., 2019, Nie et al., 2021).
For example, the CRISPR/Cas9 tool was used to generate knockout mutations in the Honey bee major royal jelly protein 1 (Kohno et al., 2016, Hu et al., 2019) or to study the melanisation of the cuticle via knockout of Amyellow-y gene (Nie et al. 2021).

BeeLife always promotes science and science-based policy, and we understand that CRISPR/cas9 can be a tool for better understanding the physiology or development of animals. However, since the beginning, the beekeeping community has expressed reluctance to this. In 2014, the evolutionary geneticist Martin Beye's team successfully used gene-editing techniques to produce a genetically modified queen bee.

The beekeepers' community at that time argued that honey bees are a public good and that there is no need for Frankenbees[2]. The fear was that firms would use Schulte *et al.* (2014) paper as a roadmap to genetically modify, patent and privatise their own bees in a strategy similar to what the agriculture industry has done with seeds and pesticides.

It is precisely what happened with the work led on pesticide-ready bees (Jayaweera *et al.*, 2024): growers who require pollination but who are using pesticides, even spraying) need the honey bees to be strong and to "digest" the pesticide cocktail they are ingesting: "*This research highlights the potential of using novel advanced biotechnological tools to achieve pesticide resistance in honey bees*".

While the need for effective pollination is undeniable, the focus should not be on genetically engineering bees to withstand pesticides but rather on improving agricultural practices. Integrated Pest Management (IPM) strategies are required by law to reduce the dependence and use of pesticides. They should be prioritised as a

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https://www.theguardian.com/environment/2018/oct/16/frankenbees-genetically-modified-pollinators-danger-of-building-a-better-bee

more sustainable approach, rather than resorting to genetic modifications that may have unintended ecological consequences.

The research into pesticide-resistant bees emphasises using biotechnological tools to develop bees capable of surviving pesticide exposure. We caution that this approach does not address the underlying issues of unsustainable pesticide use and instead offers a technological fix that may exacerbate the problem. Such interventions' ethical, ecological, and social ramifications must be carefully considered in the broader context of agricultural sustainability.

Conclusion

In conclusion, while BeeLife does not deny the potential of new biotechnologies (at least for research), we stress that their application must be thoroughly examined regarding their societal impact. We advocate for a regulatory framework that carefully weighs the long-term consequences for biodiversity, ecological integrity, and public acceptance. The future of biotechnology in agriculture should be shaped by a balanced approach prioritising sustainability, environmental responsibility, and the health and welfare of all species involved.