

Edible insects: conclusions

Between 2015 to 2019 there were numerous studies published looking at the safety for consumption of edible insects, of which this review identified 98 relevant publications. However, some knowledge gaps still remain unaddressed. Table D, in the Appendices section, provides a summary of the key hazards identified in this review for each insect species.

5.1 Microbiology and AMR

Edible insects have a highly variable microbial profile across, and within species. There exists a risk for edible insect products to present high levels of microbial contamination. This may be caused by excessive microbial growth as a consequence of inadequate refrigeration and storage of raw materials, by cross-contamination throughout the food chain, or if the rearing conditions fail to comply with the hygienic described in Regulations, as mentioned in section 1.3. The literature shows that treating the product with high temperatures for several minutes can reduce the microbial load significantly although the exact time and temperature of exposure has not been determined. As with other food types, consideration must be given to the appropriate storage of both raw and processed ingredients and products, both to minimise the growth of microorganisms present and to reduce the risk of cross- contamination.

Further studies are required to determine precisely the nature of the microflora of relevant edible insect species, in order to better understand the effectiveness of control measures and the microbial populations that need to be included as part of the product's composition and specification analyses.

Production of insects in large quantities will increase the risk of disease within the insect population and between insect farms. Treating the population with antibiotics would have a potential negative impact on antimicrobial resistance. Optimisation of hygienic rearing practices may be considered to avoid the need to use antimicrobials to control disease transmission. More research will be required to better understand disease transmission mechanism within and across farmed insect populations, as well as the most effective ways of control.

The use of thorough HACCP protocols in line with good microbiological practices, as well as traceable substrates for rearing insects may wish to be considered to reduce the impact of microbiological contamination of edible insects.

5.2 Toxicology

Edible insects, larvae in particular, have the potential to accumulate toxic compounds, particularly heavy metals, when fed contaminated substrate. The evidence regarding accumulation of mycotoxins and pesticides is contradictory across the literature. Ensuring hygienic rearing practices and minimising levels of contamination of the substrate can help avoid accumulation of all toxic compounds that are not produced by the insect.

There are numerous knowledge gaps regarding insect's bioaccumulation potential and the impact of metabolism of toxic compounds. More research would also clarify whether heat processing could cause the formation of toxic substances such as acrylamide, furan or polycyclic aromatic hydrocarbons. Future studies could help identify if toxic metabolites may form as a result from the

metabolisation of mycotoxins within the insect, if these remain in the final product, and in which quantities they may be found.

5.3 Allergenicity

Edible insects pose a risk to consumers allergic to shellfish, therefore consideration may be given to informing consumers accordingly through labelling. There is a risk of insects causing de-novo sensitisations in the future, but this information cannot be predicted with precision based on the existing literature. Future monitoring of cases and further research will be necessary to fully understand the de-novo sensitisation potential of the different species of edible insects, and how their processing, stage of development and feed may affect this potential.

5.4 Composition variability

Edible insects' larvae present variable compositions depending on the composition of the substrate fed to them and the time of harvest. This poses a risk of misleading consumers. Standardisation of substrates and batch-mixing can minimise composition variability. None of the articles identified studied the variability within batches fed with the same feed. Further research is needed to identify how standardised insect feeds affect composition variability across and within populations. This would allow to relate the feed and insect composition to the final product's specification.

5.5 Human consumption and exposure data

The review did not retrieve articles or official documents studying human consumption or exposure analysis data in the United Kingdom. Understanding how edible insects are consumed by the UK's population would allow to identify species preferred by consumers, the role of the food in the diet, and throw light into the allergic sensitivity profile of the UK population to edible insects. This, paired with exposure data collected systematically, would help narrow the risks posed by the food and identify ways to manage such risks, as well as optimise research efforts.