

Investigation into possible sources of semicarbazide in honey

Area of research interest: [Chemical hazards in food and feed](#)

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Background

Semicarbazide is a breakdown product of the antibiotic nitrofurazone (which is genotoxic to humans and as such is banned from use in food producing animals) and is consequently used as an indicator in tests to detect the use of nitrofurazone in food producing animals.

The detection of semicarbazide in samples of Scottish heather honey from hives which were unlikely to have been treated with nitrofurazone, suggested that semicarbazide may have originated from some other currently unidentified source. Although EFSA's 'Opinion on Semicarbazide in Food' concluded that semicarbazide is not a concern for human health at levels found in food, it could adversely affect consumer confidence in this product and severely damage the honey industry.

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Research Approach

Literature review into potential natural sources of semicarbazide in honey. This included any sources containing information indicating whether semicarbazide could be produced in honey by natural processes.

The relevant literature was critically reviewed with respect to the evidence reported, the quality assurance procedures used, the feasibility of any formation mechanisms suggested, and evidence of confirmatory work.

Hypotheses were developed on theoretical routes leading to the possible contamination or production of semicarbazide in honey and recommendations made for potential techniques and further field and laboratory based research studies that could help to validate the hypotheses regarding the sources of semicarbazide in honey.

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Results

Semicarbazide forms naturally in certain shellfish, seaweed, eggs, and whey. Certain nitrogenous compounds, principally the amino acid arginine, have been proposed as precursors of semicarbazide in these foods, and arginine has been reported to be present at a high level in some shellfish.

The literature review identified several publications reporting the presence of arginine in heather honey, although not at levels higher than in other types of honey. However, dew collected in traps has shown some amino acids, notably arginine, can reach very high levels on certain occasions.

Based on these reports, this study hypothesises that arginine levels could have been elevated shortly before and during the production of the affected honey. A hypothetical pathway for the formation of semicarbazide from arginine has been described.

The review concluded that other possible sources of the semicarbazide reported in heather honey could be as-yet unidentified precursors, environmental contaminants or the illicit use of nitrofurazones or other nitrofurans which were not detected by the analytical methods used. However, the absence of other metabolites of nitrofurans, and the known provenance of the honey contradict this.

The review provides a number of recommendations for future research, including:

- field studies to monitor semicarbazide and arginine in heather honey
- laboratory research to verify whether semicarbazide is a reliable marker for the detection of the illicit use of nitrofurazone
- validation of alternative methods for detection of semicarbazide in samples of honey and other food
- studies of semicarbazide and its precursors in plants, bees and honey
- investigations of the in-vitro formation of semicarbazide in honey from naturally occurring precursors

Research report

PDF

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