



## Developments in food contaminants

Acrylamide, vegetable oil contaminants, chlorates

Luke Murphy

A Leatherhead Food  
Research white paper

37

---

## Developments in food contaminants

New developments in science and chemical analysis enable us to learn more about possible contaminants in food and beverage products. In this white paper, Luke Murphy discusses acrylamide in baked and fried starchy foods, contaminants found in vegetable oils as a result of processing, and chlorates in fruit and vegetables.

Relatively recently, some of the processes we use on an industrial scale to manufacture food, and on a smaller scale to cook food at home have raised some concerns. This paper focuses on three such developments: acrylamide (which was identified as a food contaminant in 2002), certain process contaminants found mainly in vegetable oils, and finally chlorate.

There is evidence that all three groups of substances are toxic when ingested and hence the amounts in our diet should be reduced as much as possible. The European Food Safety Authority (EFSA) has published opinions on all these subjects<sup>1,2,3</sup> and, at the time of writing, discussions are progressing at European level regarding overarching legislation.

### Acrylamide

Acrylamide was originally known as an ingredient of certain industrial copolymers, used widely for non-food applications, such as paper and plastic manufacture. However, studies published in 2002 also discovered it in

foods, specifically in certain starchy foods heated above 120°C. This is a concern because it has also been established that acrylamide and associated products could be carcinogenic and genotoxic. Because the foods affected (which include bread, biscuits, fried potato products and coffee) are so widely consumed, this is potentially a global issue. Many acrylamide containing foods have been required to carry a warning in the state of California, USA, for many years<sup>4</sup>.

Over the past decade or so voluntary measures have been in place in Europe to encourage industry to reduce acrylamide, however following an updated EFSA opinion published in May 2015<sup>1</sup>, the European Commission has recently decided to introduce additional regulatory controls. At the time of writing this is likely to be in the form of a separate regulation under Article 4 of Regulation 852/2004 on the hygiene of foodstuffs, which will probably require businesses to take into account industry codes of practice as part of food safety management. The final decision is still pending.

---

<sup>1</sup> <https://www.efsa.europa.eu/en/press/news/150604>

<sup>2</sup> <http://onlinelibrary.wiley.com/doi/10.2903/j.efsa.2016.4426/full>

<sup>3</sup> <http://onlinelibrary.wiley.com/doi/10.2903/j.efsa.2015.4135/full>

<sup>4</sup> <http://oehha.ca.gov/proposition-65/general-info/proposition-65-plain-language>

---

## Process-related contaminants

Regarding process contaminants, in an opinion published in May 2016, EFSA completed its investigation of the risks associated with human consumption of several substances found in vegetable oils and infant formula.

Glycidyl fatty acid esters (GE) have been found in refined vegetable oils (where they appear to be formed during heating associated with oil refining) and infant and follow on formulae. 3-monochloropropanediol and 2-monochloropropanediol (3-MCPD and 2-MCPD) fatty acid esters are also produced in vegetable oils during the refining process, and have in addition been found in infant and follow on formula<sup>2</sup>.

Action from the industry has effectively led to the halving of GE levels in products between 2010 and 2015. Levels of GE, however, are still high in palm oils and fats. Other oils and fats and other processed foods including margarine have also been found to contain significant amounts. The main concerns are centred on younger consumers, as GE can be present in infant formula and is a particular concern for babies who consume solely infant formula.

A European consultation concluded in September 2016 and discussed various options. One option on the table is regulatory limits; for example a maximum level of glycidyl esters of 1.0 mg/kg in vegetable oils and fats, which may apply from September 2017. However, the final decision has not at the time of writing been made.

## Chlorates

The situation regarding chlorates is slightly different, in that it used to be a component of certain EU authorised plant protection products (pesticides); but these were phased out in 1991. Since then a default Maximum Residue Level (MRL) applies – a maximum of 0.01 mg/kg for all food and feed commodities.

However, chlorate is also formed as a by-product when chlorine based disinfectants (such as chlorine, dioxide and chlorite) are used as processing aids. This is common practice in the fresh produce industry to maintain good hygiene practice. These same disinfectants are also commonly used in drinking water to prevent the growth of undesirable bacteria.

Because washing (either with potable water – or with water with added chlorine-based disinfectants) is so common in the food industry, it is almost inevitable that chlorate residues will therefore be found in certain foodstuffs, above this default level of 0.01mg/kg. This is particularly problematic in fruit and vegetables that require extensive washing to be a suitable commercial quality. Indeed, two samples of prepared fresh fruit (from the UK), which had been dipped in chlorinated water then rinsed, were found to contain a residue of chlorate at a level of 0.03, which is above the default MRL, as recently as August 2016<sup>5</sup>.

The European authorities therefore proposed temporary Maximum Residue Levels for various food commodities depending on the ALARA principle ('as low as reasonably

---

<sup>5</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/562578/pesticide-residues-rolling-august-2016.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/562578/pesticide-residues-rolling-august-2016.pdf)

---

achievable'), which would be reviewed after a five year period when new data is available.

Another option on the table is concerning a more technical interpretation of the law. In these specific cases the chlorate presence in the food is not within the scope of the pesticides legislation (as they are added through a different route, for example disinfectants); this means the general food safety principle can be used (as it is detailed in Article 14 of Regulation (EC) 178/2002) on a case by case basis until the full risk assessment by EFSA has been completed. At the time of writing this appears to be the preferred option, at least as an interim measure.

If you are marketing food in the UK, EU or rest of the world and have concerns about any of these contaminants, and how they may affect the legal sale of the foods you supply, contact our regulatory team who would be happy to help provide information and support:

[legislation@leatherheadfood.com](mailto:legislation@leatherheadfood.com).

---

### **How Leatherhead can help**

If you are concerned about food contaminants in a particular market or a range of markets we can help provide information, be this on an ad-hoc basis or a more extensive database of applicable limits for the food commodities you sell. Contact [legislation@leatherheadfood.com](mailto:legislation@leatherheadfood.com) with any of your contamination questions.

### **About the author**

Luke Murphy manages one of the three Regulatory teams at Leatherhead and also advises on UK, Ireland and EU food legislation. He has a BSc in Food Science from the University of Leeds and five years of experience in the food industry, including product development roles at Mars Petcare and Unilever Beverages, and three years as a technologist for Leathams Ltd. Luke joined Leatherhead Food Research in April 2006. He is also a member of the IFST food law steering group and sits on the BRDO Business expert group (Food Standards and Labelling).

---

## About Leatherhead Food Research

Leatherhead Food Research provides expertise and support to the global food and drink sector with practical solutions that cover all stages of a product's life cycle from consumer insight, ingredient innovation and sensory testing to food safety consultancy and global regulatory advice. Leatherhead operates a membership programme which represents a who's who of the global food and drinks industry. Supporting all members and clients, large or small, Leatherhead provides consultancy and advice, as well as training, market news, published reports and bespoke projects. Alongside the Member support and project work, our world-renowned experts deliver cutting-edge research in areas that drive long term commercial benefit for the food and drink industry. Leatherhead Food Research is a trading name of Leatherhead Research Ltd, a Science Group Company.

[help@leatherheadfood.com](mailto:help@leatherheadfood.com) T. +44 1372 376761 [www.leatherheadfood.com](http://www.leatherheadfood.com)

## About Science Group plc

Science Group plc offers independent advisory and leading-edge product development services focused on science and technology initiatives. Its specialist companies, Sagentia, Oakland Innovation, OTM Consulting and Leatherhead Food Research, collaborate closely with their clients in key vertical markets to deliver clear returns on technology and R&D investments. Science Group plc is listed on the London AIM stock exchange and has more than 350 employees, comprised of scientists, nutritionists, engineers, mathematicians and market experts.

Founded in 1986, Science Group was one of the founding companies to form the globally recognised Cambridge, UK high technology and engineering cluster. Today Science Group has two dedicated, UK-based R&D innovation centres in Cambridge and Epsom, and additional offices in London, Boston, Houston and Dubai.

[info@sciencegroup.com](mailto:info@sciencegroup.com)

[www.sciencegroup.com](http://www.sciencegroup.com)