Assessment of food product characteristics: Expert opinion

Final Report

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Summary

Food products can be categorised (e.g. high, medium, low) based on potential for causing illness or serious harm (i.e. growth or presence of microbial pathogens, presence of chemical contaminants, biotoxins etc). This type of categorisation can be a useful tool for describing the food safety risks associated with different types, or groups, of imported commodities[1].

An expert knowledge elicitation (EKE) approach was developed by the FSA, aimed to assess and categorise the inherent food product safety risks of different Products Of Animal Origin (POAO) imported in the UK. Experts rated the worst-case likelihood of relevant microbiological pathogens, biotoxins and chemical contaminants being present at levels which are of potential public health concern when eaten in various POAO categories.

A selected panel of experts first completed an online questionnaire to provide their own separate likelihood category scores for each product category in terms of microbiological pathogens, biotoxins and chemical contamination. The responses also included the experts' justification for the scores and an assessment of their confidence in the scores. All responses were analysed by the FSA to inform provisional scores, based on the number of experts who assigned a particular likelihood category score to a particular product category/hazard group combination and the experts' confidence in the scores.

The provisional scores were then presented to the experts and used as the starting point for discussion and revision at a facilitated workshop on 15 February 2021. The experts were asked to state their rationale for their statements. The revised assessments were collected and consensus scores agreed. During the workshop, an overall score was also assigned to each product category based on the worst case of its three scores.

This report describes the EKE approach and the estimates and views of the experts, based on the information available to them, at that time.

Identification and selection of expert panel

The panel comprised fourteen experts who had experience of more than two years in at least one of the following areas:

1. Risk assessment relating to microbiological or chemical food safety
2. Imported food intelligence

The panel members were selected on the basis of both their experience and their availability and willingness to participate within the required timeframes.

The panel involved ten representatives from FSA and Food Standards Scotland (FSS). Four members of the Advisory Committee on the Microbiological Safety of Food (ACMSF) and Committee on Toxicity (COT) participated, although they acted in an individual expert capacity for the purpose of this exercise rather than on behalf of the Committees.

Issue familiarisation of experts

An information pack was sent to the expert panel members for reading before they completed the questionnaire. The pack contained information on the relevant product categories (including a description of the products in each category), and their expected conditions of intended use as shown in Annex 1 – Product category background information. The pack also specified the relevant hazards, included a likelihood categorisation scoring scale and outlined what the expert panel were asked to base their scores on.

The purpose of providing the information pack to the experts before they completed the on-line assessment questionnaire was ensure a common understanding among the experts.

Product categories

The exercise focused on the 19 categories of POAO relating to food for human consumption (HC) as described in Annex 1 of Regulation 2019/2129:

1. Minced meat, mechanically separated meat and meat preparations for human consumption (HC)
2. Meat other than meat mentioned in the category above, and meat products derived from such meat, for HC
3. Poultry meat products for HC
4. Poultry meat for HC
5. Rabbit meat, game meat, and their meat products for HC
6. Eggs for HC
7. Egg products for HC which are preserved at frozen or chilled temperatures
8. Egg products for HC, other than those mentioned in the two categories above
9. Milk for HC
10. Dairy products and colostrum-based products for HC, which are preserved at frozen or chilled temperatures
11. Dairy products and colostrum-based products for HC other than those mentioned in the category above
12. Rendered animal fat and greaves for HC
13. Honey and other apiculture products for HC
14. Frog legs and snails for HC
15. Insects for HC
16. Gelatine and collagen for HC
17. Highly refined products for HC
18. Fishery products from aquaculture and bivalve molluscs for HC, which are not in hermetically sealed containers intended to render them stable at ambient temperature
19. Fishery products other than those mentioned in the category above

Hazard groups

Panel members assigned scores for each of the 19 categories of POAO in relation to each of the following hazard groups:

1. Microbiological pathogens

2. Biotoxins
3. Chemical contamination

Table 1 was provided to the panel in the information pack to enable a consistent understanding of which types of hazard fall into each group.

Table 1. Hazard Groups

Hazard Group	Specific Hazard
Microbial pathogens	*Campylobacter*
Microbial pathogens	*Clostridium perfringens*
Microbial pathogens	*Listeria monocytogenes*
Microbial pathogens	Shiga toxin producing *Escherichia coli* (STEC)
Microbial pathogens	*Salmonella*
Microbial pathogens	*Staphylococcus aureus*
Microbial pathogens	Coagulase positive staphylococci
Microbial pathogens	Human pathogens found in fish
Microbial pathogens	*Vibrio cholerae*/*Vibrio parahaemolyticus*
Biotoxins	Marine biotoxins
Biotoxins	Mycotoxins
Biotoxins	Histamine
Chemical contamination	Additives
Chemical contamination	Heavy metals

Hazard Group	Specific Hazard
Chemical contamination	Organic pollutants
Chemical contamination	Pesticides
Chemical contamination	Veterinary drug residues
Chemical contamination	Processing aids (e.g. sterilants)

These reflect the hazards which may be tested for during physical checks carried out on imported food at BCPs, which are based on the legislation outlined in Annex 2.

The following were out-of-scope of this exercise:

- *Clostridium spp.* other than *C. perfringens*, *Bacillus spp.*
- Antimicrobial resistance
- Viruses
- Parasites other than those found in fish
- Transmissible Spongiform Encephalopathies (TSEs)
- Radiological hazards

Likelihood category scoring scale

The expert panel were asked to provide likelihood category scores based on the scale shown in Table 2, which has been reproduced from the European Food Safety Authority [2]. During the workshop, it was noted that the key point was to consider the likelihood that the product categories could be of public health concern relative to each other rather than in absolute terms, this will help to inform which product categories need a higher or lower level of checks compared with others. In the assessment questionnaire, there was an additional option to estimate risk as 'very low/low'.

The information pack included the above likelihood category scoring scale, which was accompanied by an example of quantitative bounds corresponding to the qualitative descriptions. However, it was decided during the workshop that the quantitative bounds should not be used.

Table 2. Likelihood category scoring scale

Frequency category	Interpretation
Negligible	So rare that it does not merit to be considered
Very low	Very rare but cannot be excluded
Low	Rare but does occur
Medium	Occurs regularly
High	Occurs very often
Very High	Events occur almost certainly

The experts were asked to base their scores on the points described in Table 2, which was included in the information pack.

Table 3: Outline of what the expert panel were asked to base their scores on for the three hazard groups

Hazard group	What are the scores based on?
Microbiological pathogens	The likelihood of any of the microbiological pathogens mentioned in Table 1 being present per kilogram of imported product in the category in sufficient levels to cause illness when eaten and/or to cause cross-contamination which leads to illness. For example, this can include: • the likelihood of the microbiological pathogens mentioned in Table 1 being present

Hazard group	What are the scores based on?
	in imported products in the category when they reach the UK • The likelihood that the product could support the growth of microbiological pathogens • The likelihood that a control measure will mitigate the risk (e.g. cooking, pasteurisation or canning by industry or cooking at the consumer level) • The likelihood that microbiological pathogens in the product could lead to cross-contamination resulting in illness • Evidence of illness caused by products in the category
Biotoxins	The likelihood of the biotoxins mentioned in Table 1 being present per kilogram of imported product in the category at levels which are of potential public health concern when eaten. For example, this can include: • The likelihood that biotoxins mentioned in Table 1 will be present in imported products in the category at levels which are of potential public health concern when they reach the UK • The likelihood that a control measure carried out in the UK will mitigate the risk
Chemical contamination	The likelihood of the types of chemicals mentioned in Table 1 being present per kilogram of imported products in the category at levels which are of potential public health concern when eaten.

The expert panel were also asked to base their scores on:

- Normal expected conditions of use and the initial contamination happening in the exporting country rather than in the UK.
- Products within the category from all exporting countries rather than on a per-country basis.
- The worst-case product in the product category from the worst-case country rather than, for example, the average risk for the product category. During the workshop it was noted that there could be significant variation in risk within some of the product categories (e.g. dairy products and colostrum-based products for HC which are preserved at frozen or chilled temperatures). However, it was highlighted that the approach taken would involve considering the worst-case for each product category for human consumption as described in Annex 1 of Regulation 2019/2129 [3].
- The actual volume of product imported to the UK was not considered in the scores.

Panel members did not provide scores for the hazard groups (i.e. microbiological pathogens, biotoxins or chemical contamination) that were outside their area of expertise. However, where panel members provided scores for a hazard group, this was done for all 19 product categories in relation that hazard.

The panel members did not speak to the other experts invited to the meeting prior to the workshop so that individual views, based on their own expertise, were captured in the assessment questionnaire. The workshop was then used as a place for discussion to agree consensus scores as a group.

Purpose

An expert knowledge elicitation (EKE) was held in order to estimate assess and categorise the public health risk associated with 19 categories of imported

Products of Animal Origin (POAO) in terms of relevant microbiological pathogens, biotoxins and chemical contaminants.

Contents

Methodology

A Delphi technique was used to elicit the expert opinion [4] with the following steps:

- Development of the questionnaire including a user test.
- Identification and selection of experts.
- Issue familiarisation of experts with provision of background materials.
- Elicitation of experts using the questionnaire.
- Aggregation and presentation of results.
- Review of results by experts and revision of initial answers by experts.
- Process repeated until consensus was achieved (achieved through one workshop).
- Summary of results prepared with argument summary.

Provisional scores

Once the questionnaire was completed separately by the experts, the results were analysed by FSA Operational Researchers. For each product category and for each of the three hazard groups (microbiological pathogens, biotoxins, chemical), tables were created showing the number of experts who had assigned a particular likelihood category to each product category/hazard group combination in order to assess the extent to which the experts' scores were aligned with each other's.

The scores were colour coded, with those giving a low confidence in their score in red, and those giving either a medium or high confidence in green. An example of a table of provisional scores created for a product category is show in Table 3 in the annex. The justifications for the scores provided by each expert were provided alongside these tables.

Expert elicitation workshop

During the workshop, it was noted that not all of the experts rated their levels of confidence on the same basis. This was taken into account during the consensus discussions and did not affect the final outcome.

During the workshop, the experts discussed their rationale for their input and were given the opportunity to revise their estimates. The panel agreed a consensus score for each of the 19 product categories and three hazard groups. Each product category was considered in turn. The relevant microbiological pathogens, biotoxins and chemicals were discussed separately for each product category in turn, in order for the expert panel to agree a consensus score for each.

The group discussion was based on qualitative consideration of hazard rates in product groups and was not associated with any numerical values.

The provisional scores were used as a starting point to aid the discussion. Individuals on the higher end of the provisional scores were invited to outline why they felt the provisional score was too low, while individuals on the lower ends were invited to outline why they felt the provisional score was too high. This opened discussions which led to individual experts reflecting on the information provided by the other experts and in some cases changing their scores. The 50% rule was again used to create a score reflecting the majority view once individual experts had changed their scores. The experts were then asked by the facilitator if they were in broad agreement with the final chosen score, thereby creating the consensus score.

The final scores were agreed by the expert panel. This included an overall score for each product category which was based on the worst case of the three hazard group scores for that product category.

The group acknowledged that, with more time, alternative schemes for elicitation and evaluation of expert opinions would be possible.

Results

Summary of discussions

The following section captures key points from the expert panel's evaluation of the product categories, including the provisional scores that were developed before the workshop and the final scores that were agreed by consensus by the expert panel during the workshop.

Minced meat, mechanically separated meat and meat preparations for HC

Microbiological pathogens

Provisional score: High

The products in this category are likely to be contaminated with *Salmonella*, Shiga toxin producing *E. coli* (STEC), *Clostridium perfringens* due to cross contamination of the meat with faecal pathogens. There was a wide spread of individual experts' scores for this category in the assessment questionnaire. However, the experts decided on reflection to agree to a high likelihood score as the exercise is concerned with the relative risk associated with the product categories rather than absolute risk.

Final score: High

Biotoxins

Provisional score: Very Low

The experts considered that biotoxins were unlikely to form in this category of product and any transfer from contaminated feed to POAO would be small.

Final score: Negligible

Chemicals

Provisional score: Low

Most experts considered the risks posed to the consumer by the presence of veterinary medicines, pesticides and environmental contaminants in minced meat to be low but not negligible. This was counterbalanced by two experts, one of

whom considered the likelihood to be high whereas the other considered it to be medium. Overall, the panel agreed a likelihood score of low.

Final score: Low

Meat other than meat mentioned in the category above, and meat products derived from such meat, for HC

Microbiological pathogens

Provisional score: Medium

The products in this category are likely to be contaminated with *Salmonella*, STEC, *Clostridium perfringens* due to cross contamination of the meat with faecal pathogens. The experts' discussion focused on the products in this category and the difference compared to the previous category. Fresh carcasses and cuts of meat, which are part of this category, are considered to present less microbiological risk than minced meat or mechanically separated meat, as there is less processing and handling. However, the inclusion of offal and sausage in this category meant that the distinction was not straightforward. The ready-to-eat products also present risks from *Listeria monocytogenes*. Overall, this category and the previous category were considered sufficiently different in order to justify a lower likelihood score.

Final score: Medium

Biotoxins

Provisional score: Very Low

The experts' scores ranged from low to negligible for this category. It was acknowledged that histamine could potentially be found in some products. Very few notifications circulated via the Rapid Alert System for Food and Feed (RASFF) had been found for biotoxins in this product category.

Final score: Very Low

Chemical contamination

Provisional score: Low

The experts' discussion followed the same course as for the first category, with low a likelihood score being agreed by the panel.

Final score: Low

Poultry meat products for HC

Microbiological pathogens

Provisional score: High

Pathogens such as *Campylobacter*, *Salmonella* and *Listeria monocytogenes* are likely to be present in these products. *Campylobacter* is one of the most common foodborne pathogens in the UK and the primary source of illness is thought to be poultry meat. The inclusion of ready-to-eat products and liver products such as pates, which have been associated with outbreaks of illness and will support the growth of pathogens, led the experts to conclude that this score is justified.

Final score: High

Biotoxins

Provisional score: Very Low

Individual experts' scores ranged from very low to negligible, with the expectation that levels of any biotoxins in these products would be very low and therefore not a risk to consumers.

Final score: Very Low

Chemical contamination

Provisional score: Low

Contaminants, such as veterinary medicines (for example coccidiostats) organic pollutants and heavy metals, although possibly present in some products, were regarded by the experts as generally likely to be present at low levels. Moreover, the greater risk to the consumer would be from chronic rather than acute consumption, so there would not be an immediate risk to health.

Final score: Low

Poultry meat for HC

Microbiological pathogens

Provisional score: High

Pathogens such as *Campylobacter* and *Salmonella* are likely to be present in these products and lead to illness due to undercooking and cross-contamination. *Campylobacter* is one of the most common foodborne pathogens in the UK and the primary source of illness is thought to be poultry meat. The experts agreed that the provisional score accurately reflects the likelihood that products in this category could cause human illness.

Final score: High

Biotoxins

Provisional score: Very Low

As in previous categories, the presence of biotoxins in these meat products was regarded by the experts as being unlikely.

Final score: Very Low

Chemical contamination

Provisional score: Medium

Most individual experts' scores were low to very low, although it was recognised that harmful substances could be present in this meat as in the previous category. During the discussion, the experts who gave a score of medium agreed with the rationale of the others in the group that overall the likelihood of a risk to health would be low.

Final score: Low

Rabbit meat, game meat, and their meat products for HC

Microbiological pathogens

Provisional score: Medium

The discussion centred around the wide range of products covered in this category. While rabbit meat has not been associated with many contamination incidents, a large uncertainty is present about the processing of animals such as

dolphins, crocodile, primates and reptiles etc for human consumption. Reptiles, for instance, have been associated with *Salmonella* contamination. This uncertainty was agreed by the experts to be sufficient justification to move the likelihood score to high.

Final score: High

Biotoxins

Provisional score: Very Low

In most cases the experts' scores were low to negligible, but in discussing the entire range of species involved in this category, most agreed that this could not be the case for all, and some species have been associated with histamine risk. Taking a view of the worst-case scenario, the panel agreed that the rating should be at least low.

Final score: Low

Chemical contamination

Provisional score: Medium

The experts commented upon the wide range of animal species that were included in this category and some meats were regarded as higher risk than others. Lead shot in game was highlighted, as well as organic pollutants, heavy metals and veterinary medicines (authorised or not) in some animals in this category. The consensus was that medium was the appropriate score overall.

Final score: Medium

Eggs for HC

Microbiological pathogens

Provisional score: Medium

Eggs are significant contributors to *Salmonella* foodborne illnesses. The experts commented that imported shell eggs could present a higher risk than shell eggs from the UK, due to a lack of quality assurance schemes such as the "Lion Code of Practice", and this should be reflected with a high likelihood score.

Final score: High

Biotoxins

Provisional score: Very Low

The experts believed that the probability of biotoxins being present in eggs in their shells would be very low to negligible and were content with the provisional score.

Final score: Very Low

Chemical contamination

Provisional score: Low

The previous incident with fipronil showed that chemical contamination of eggs for HC was a possibility. The experts regarded the presence of contaminants such as veterinary medicines, dioxins and PCBs at levels of concern to be a possibility although, overall, the risk to the consumer was low.

Final score: Low

Egg products for HC which are preserved at frozen or chilled temperatures

Microbiological pathogens

Provisional score: Medium

Eggs are significant contributors to *Salmonella* foodborne illnesses. The experts commented that liquid egg yolks are relatively unstable products, in terms of shelf life, and the more involved production processes could lead to more hygiene issues when compared to shell eggs. There have also been *Salmonella* outbreaks associated with contaminated pasteurised liquid egg. However, the additional processing in this category was considered to reduce the risk when compared to the previous category.

Final score: Medium

Biotoxins

Provisional score: Very Low

The experts found that there was no strong evidence for the presence of biotoxins in frozen or chilled egg products.

Final score: Very Low

Chemical contamination

Provisional score: Medium

The experts considered that overall, the risks from these commodities were no greater than for whole eggs, so the score should be consistent.

Final score: Low

Egg products for HC, other than those mentioned in the two categories above

The description of the food products in this category changed after submission of the assessment questionnaire responses, therefore during the workshop, a risk ranking was agreed for all 3 hazards de novo during the workshop.

Microbiological pathogens

Eggs are significant contributors to *Salmonella* foodborne illnesses. The experts concluded that a lack of microbiological incidents concerning egg albumin and albumin providing less of a microbiological concern than egg yolk would justify a risk score of low.

Final score: Low

Biotoxins

Provisional score: Very Low

These products were regarded in the same light as other egg products and the experts were therefore content with the provisional score.

Final score: Very Low

Chemical contamination

Provisional score: Medium

The experts pointed out that that it is largely the yolk of eggs, being rich in fat, into which lipophilic substances like persistent organic pollutants dissolve, not the

albumin, which had a higher water content. Therefore, the risk to consumers from these products is relatively low.

Final score: Low

Milk for HC

Microbiological pathogens

Provisional score: Medium

Consumption of raw cows' milk and incorrectly pasteurised milk has been associated with illness due to *Listeria monocytogenes, Salmonella, Staphylococcus aureus, Campylobacter* and STEC. Given that the milk imported is either heat treated prior to export or the raw milk is pasteurised in the UK, this product category was seen to be less risky than the raw and processed meat categories from a microbiological point of view.

Final score: Medium

Biotoxins

Provisional score: Very Low

The experts recognised that biotoxins could contaminate milk from contaminated feed but the fact that most milk is blended from different farms would lead to levels for the consumer being very low to negligible. The consensus was that the score should be reduced.

Final score: Negligible

Chemical contamination

Provisional score: Low

One expert chose a medium score, having considered that there was the possibility of heavy metals in milk that might pose a risk to young children, however, the consensus was to retain the overall low score.

Final score: Low

Dairy products and colostrum-based products for HC, which are preserved at frozen or chilled temperatures

Microbiological pathogens

Provisional score: High

Consumption of dairy products has been associated with illness due to *Listeria monocytogenes, Salmonella, Staphylococcus aureus, Campylobacter* and STEC. The conversation focused on raw milk cheeses, as they present the worst-case scenario in this category. Raw milk cheeses have been subject to a number of RASFF notifications, as well as connected to outbreaks of illness. Given that this category includes ready-to-eat products that will not undergo further processing, and can be contaminated with *Listeria monocytogenes*, which presents a high risk to vulnerable groups such as pregnant women, a high likelihood score was considered appropriate.

Final score: High

Biotoxins

Provisional score: Very Low

Experts pointed out that a range of cheeses have been found to have significant levels of histamine, which can cause symptoms in consumer that are similar to allergic reactions and that this might be a greater problem in young children. Therefore, the rating should be higher than very low. The low rating was regarded as more appropriate.

Final score: Low

Chemical contamination

Provisional score: Low

Considering the low numbers of alerts for this category of products, the experts were content with the provisional score. Although they recognised that organic pollutants, veterinary drugs, heavy metals and hormones could be present in imported products the risk to the consumer from any present would be low. The experts were content that the provisional score should stand.

Final score: Low

Dairy products and colostrum-based products for HC other than those mentioned in the category above

Microbiological pathogens

Provisional score: Medium

Products in this category are likely to be subject to more treatments and processing in comparison to milk for human consumption, which will reduce levels of pathogens. Dried products will also not support the growth of pathogens. *Staphylococcus aureus*, and particularly staphylococcal enterotoxins, has been identified as being of notable concern in dried dairy products.

Final score: Medium

Biotoxins

Provisional score: Very Low

As this category of products did not include cheeses, it was thought to present a lower risk than the previous category.

Final score: Very Low

Chemical contamination

Provisional score: Low

As for the category above, considering the low numbers of RASFF notifications for this category of products, the experts were content with the provisional score. Although they recognised that organic pollutants, veterinary drugs, heavy metals and hormones could be present in imported produce the risk to the consumer from any present would be low.

Final score: Low

Rendered animal fat and greaves for HC

Microbiological pathogens

Provisional score: Very Low

Most of the products in this category are highly processed, including heat treatments which will significantly reduce levels of pathogens. However, this is not

always the case and the FSA is aware of incidents of microbiological contamination in beef dripping, which would justify a risk score of low. *Salmonella* has been identified in rendered products in a number of scientific publications.

Final score: Low

Biotoxins

Provisional score: Very Low

The experts considered that the potential for transfer of biotoxins from contaminated feed into these products would be very low. The provisional score could therefore stand.

Final score: Very Low

Chemical contamination

Provisional score: Very Low

The experts felt that although there was the potential for fat soluble persistent organic pollutants to be present in this product category, for harm to be done, very long exposure times, perhaps in the order of years would be necessary. They therefore felt that the rating should be retained.

Final score: Very Low

Honey and other apiculture products for HC

Microbiological pathogens

Provisional score: Very Low

Honey does not support the growth of microorganisms. There have not been many incidents of microbiological contamination of these products, or outbreaks caused by the pathogens of concern in this exercise, so a likelihood score of very low was deemed appropriate based on the possibility of some cross-contamination, for example with *Clostridium perfringens*.

Final score: Very Low

Biotoxins

Provisional score: Very Low

The experts felt that biotoxins were unlikely to form within this product and even if there were transfer from bees foraging on a contaminated crop, blending of the final product would generally mitigate this. The experts agreed that the provisional score could stand.

Final score: Very Low

Chemical contamination

Provisional score: Low

The experts flagged up possible hazards such as pesticides, antibiotics and pyrrolizidine alkaloids as potential contaminants but recognised that in the final product, the risks to the consumer from these contaminants would be low. They were content for the provisional score to stand.

Final score: Low

Frog legs and snails for HC

Microbiological pathogens

Provisional score: Low

Products that are imported canned or dried are thought to present a low risk due to the additional processing and an environment that does not support the growth of pathogens. The experts concluded that given the uncertainty about practices around products in this category, and a few *Salmonella* contamination incidents in frog legs, that a score of low was merited.

Final score: Low

Biotoxins

Provisional score: Very Low

Although there had in the past been occasional reports of mycotoxins in these products, these reports were very few.

Final score: Very Low

Chemical contamination

Provisional score: Low

The possible presence in frog legs of cleaning and disinfecting agents in some products was raised, as was the possibility of the presence of plant protection products such as chlorpyrifos in snails, depending upon the source. Overall, the probability of the presence of these substances, was not clear but, considering the low number of alerts concerning them in the past the experts were content with the low rating.

Final score: Low

Insects for HC

Microbiological pathogens

Provisional score: Very Low

There is uncertainty due to a lack of data around these products and generally low consumption in the UK. Contamination of these products is likely to arise from the substrate that the insects are grown on and how it is managed. This is more likely to be an issue when the insects are gathered from the wild rather than farmed, leading to a consensus score of low.

Final score: Low

Biotoxins

Provisional score: Very Low

The experts could find little evidence of biotoxins having been found in these products.

Final score: Very Low

Chemical contamination

Provisional score: Low

One expert felt that the score should be medium on the grounds that in some parts of the world there were fewer controls on animal husbandry and diet that might lead to contaminants being present in these products. Moreover, in the case

of wild-caught insects, there was no guarantee that they had not been foraging on plants that had been treated with plant protection products. The possibility of human exposure to allergens also could not be ruled out, but this was outside the scope of the exercise. Overall, in the light of few alerts for contamination in these products, the experts were content with the provisional score.

Final score: Low

Gelatine and collagen for HC

Microbiological pathogens

Provisional score: Negligible

These products are manufactured using high temperatures, chemical treatments or other processes that eliminate pathogen contamination. These products are also unlikely to support growth of most microorganisms. The experts were content for the provisional score to stand.

Final score: Negligible

Biotoxins

Provisional score: Very Low

The experts felt that production processes mitigated the risk of the presence of biotoxins in these products and thus were content for the provisional score to stand.

Final score: Very Low

Chemical contamination

Provisional score: Low

The experts felt that the probability of contamination was low although there was always the possibility of the presence of veterinary medicines and heavy metals, but the aqueous nature of these products reduced the possibility of contamination with organic pollutants. The experts were content for the provisional score to stand.

Final score: Low

Highly refined products for HC

Microbiological pathogens

Provisional score: Very Low

These products are manufactured using high temperatures, chemical treatments or other processes that eliminate pathogen contamination. These products are also unlikely to support growth of microorganisms. The experts were content for the provisional score to stand.

Final score: Very Low

Biotoxins

Provisional score: Very Low

The experts could find little evidence of biotoxins having been found in products of this type and were content for the provisional score to stand.

Final score: Very Low

Chemical contamination

Provisional score: Very Low

Although there was the potential for contamination with environmental pollutants, the aqueous nature of these products, like that for gelatine and collagen, reduced the possibility of the presence of significant levels of organic compounds. The experts were content for the provisional score to stand.

Final score: Very Low

Fishery products from aquaculture and bivalve molluscs for HC, which are not in hermetically sealed containers intended to render them stable at ambient temperature

Microbiological pathogens

Provisional: High

These products may be contaminated at source or during processing with pathogens such as *Vibrio* and *Listeria monocytogenes*. They can also be eaten raw or lightly cooked, which increases the likelihood of illness from contaminated

products. The provisional score was considered appropriate during the workshop given previous microbiological incidents in this area, including contamination with *Salmonella*.

Final score: High

Biotoxins

Provisional: High

Most experts scored these products in the high to medium range due to the potential presence of shellfish toxins and/or histamine. Given this risk to human health, the experts were content for the provisional score to stand.

Final score: High

Chemical contamination

Provisional score: Low

Considering the wide range of commodities in the category, experts felt that a higher score would be justified for bivalve molluscs than for other fish because of the possibility of deliberate chemical contamination during aquiculture (for example with veterinary medicines to treat diseases in the animals) and the potential for contamination with heavy metals and organic pollutants. Although some fishery products might be in the low risk category, experts agreed that molluscs posed a greater risk and so the score should be higher to reflect this.

Final score: Medium

Fishery products other than those mentioned in the category above

Microbiological pathogens

Provisional: High

The fresh fish, crustaceans, shellfish and other fishery products in this category may be contaminated with pathogens including *Vibrio*. This category also includes smoked fishery products, which have been associated with illness from *Listeria monocytogenes* and *Clostridium perfringens*. The experts were content for the provisional score to stand.

Final score: High

Biotoxins

Provisional: High

The experts were content for the provisional score to stand, due to the potential presence of shellfish toxins and/or histamine.

Final score: High

Chemical contamination

Provisional score: Medium

Most of the experts scored this category as medium on the basis of the possibility of the presence of heavy metals such as mercury that had been highlighted in RASFF notifications for these products. The presence of pesticides, organic pollutants, veterinary medicines and process contaminants from, for example, the smoking process were all possible. As above, the wide range of products meant that the contamination would not be evenly spread throughout products in this category, so the experts were content with the provisional score.

Final score: Medium

Final consensus likelihood category scores

The final scores for each product category and hazard group which were agreed by the expert panel by consensus are shown in Table 4.

Table 4: Final consensus scores for each product category and hazard group

POAO category	Hazard group	Consensus score	Overall category score
Minced meat, mechanically separated meat and meat preparations for HC	Microbiological pathogens	High	High
Minced meat, mechanically separated meat and meat preparations for HC	Biotoxins	Negligible	High
Minced meat, mechanically separated meat and meat preparations for HC	Chemical contamination	Low	High
Meat other than meat mentioned in the category above, and meat products derived from such meat, for HC	Microbiological pathogens	Medium	Medium
Meat other than meat mentioned in the category above, and meat products derived from such meat, for HC	Biotoxins	Very Low	Medium
Meat other than meat mentioned in the category above, and meat products derived from such meat, for HC	Chemical contamination	Low	Medium
Poultry meat products for HC	Microbiological pathogens	High	High
Poultry meat products for HC	Biotoxins	Very Low	High
Poultry meat products for HC	Chemical contamination	Low	High
Poultry meat for HC	Microbiological pathogens	High	High
Poultry meat for HC	Biotoxins	Very Low	High
Poultry meat for HC	Chemical contamination	Low	High
Rabbit meat, game meat, and their meat products for HC	Microbiological pathogens	High	High
Rabbit meat, game meat, and their meat products for HC	Biotoxins	Low	High
Rabbit meat, game meat, and their meat products for HC	Chemical contamination	Medium	High

POAO category	Hazard group	Consensus score	Overall category score
Eggs for HC	Microbiological pathogens	High	High
Eggs for HC	Biotoxins	Very Low	High
Eggs for HC	Chemical contamination	Low	High
Egg products for HC which are preserved at frozen or chilled temperatures	Microbiological pathogens	Medium	Medium
Egg products for HC which are preserved at frozen or chilled temperatures	Biotoxins	Very Low	Medium
Egg products for HC which are preserved at frozen or chilled temperatures	Chemical contamination	Low	Medium
Egg products for HC, other than those mentioned in the two categories above	Microbiological pathogens	Low	Low
Egg products for HC, other than those mentioned in the two categories above	Biotoxins	Very Low	Low
Egg products for HC, other than those mentioned in the two categories above	Chemical contamination	Low	Low
Milk for HC	Microbiological pathogens	Medium	Medium
Milk for HC	Biotoxins	Negligible	Medium
Milk for HC	Chemical contamination	Low	Medium
Dairy products and colostrum-based products for HC, which are preserved at frozen or chilled temperatures	Microbiological pathogens	High	High
Dairy products and colostrum-based products for HC, which are preserved at frozen or chilled temperatures	Biotoxins	Low	High
Dairy products and colostrum-based products for HC, which are preserved at frozen or chilled temperatures	Chemical contamination	Low	High
Dairy products and colostrum-based products for HC other than those mentioned in the category above	Microbiological pathogens	Low	Low

POAO category	Hazard group	Consensus score	Overall category score
Dairy products and colostrum-based products for HC other than those mentioned in the category above	Biotoxins	Very Low	Low
Dairy products and colostrum-based products for HC other than those mentioned in the category above	Chemical contamination	Low	Low
Rendered animal fat and greaves for HC	Microbiological pathogens	Low	Low
Rendered animal fat and greaves for HC	Biotoxins	Very Low	Low
Rendered animal fat and greaves for HC	Chemical contamination	Very Low	Low
Honey and other apiculture products for HC	Microbiological pathogens	Very Low	Low
Honey and other apiculture products for HC	Biotoxins	Very Low	Low
Honey and other apiculture products for HC	Chemical contamination	Low	Low
Frogs legs and snails for HC	Microbiological pathogens	Low	Low
Frogs legs and snails for HC	Biotoxins	Very Low	Low
Frogs legs and snails for HC	Chemical contamination	Low	Low
Insects for HC	Microbiological pathogens	Low	Low
Insects for HC	Biotoxins	Very Low	Low
Insects for HC	Chemical contamination	Low	Low
Gelatine and collagen for HC	Microbiological pathogens	Negligible	Low
Gelatine and collagen for HC	Biotoxins	Very Low	Low
Gelatine and collagen for HC	Chemical contamination	Low	Low
Highly refined products for HC	Microbiological pathogens	Very Low	Very Low
Highly refined products for HC	Biotoxins	Very Low	Very Low

POAO category	Hazard group	Consensus score	Overall category score
Highly refined products for HC	Chemical contamination	Very Low	Very Low
Fishery products from aquaculture and bivalve molluscs for HC, which are not in hermetically sealed containers intended to render them stable at ambient temperature	Microbiological pathogens	High	High
Fishery products from aquaculture and bivalve molluscs for HC, which are not in hermetically sealed containers intended to render them stable at ambient temperature	Biotoxins	High	High
Fishery products from aquaculture and bivalve molluscs for HC, which are not in hermetically sealed containers intended to render them stable at ambient temperature	Chemical contamination	Medium	High
Fishery products other than those mentioned in the category above	Microbiological pathogens	High	High
Fishery products other than those mentioned in the category above	Biotoxins	High	High
Fishery products other than those mentioned in the category above	Chemical contamination	Medium	High

Annex 1: Product category background information

The following section contains information on the products within each product category and their expected conditions of intended use. These background materials were provided to the expert panel before they completed their assessment questionnaire to aid their understanding. The objective of this step was to ensure there was a common understanding among the experts of the issues.

Minced meat, mechanically separated meat and meat preparations for human consumption (HC)

Products in category

Products in this category include minced meat, mechanically separated meat and meat preparations. They can be fresh, chilled or frozen and of any livestock species. Please note that this category excludes poultry products.

Expected conditions of intended use

Consumption data is available for this category, however intended use cannot be completely defined. In most cases, foods in this category would be expected to be consumed fully cooked, however there may be circumstances in which this type of meat is consumed raw such as in the case of less-than-thoroughly cooked burgers or meat tartare. This may depend on the animal from which the product is derived e.g. bovine meats are more likely to be less-than-thoroughly cooked. FSA advice on consumption of less-than-thoroughly cooked meat is available [5]. This category is likely to be included in home and imported recipes at various inclusion levels. Various population groups could be consumers.

Meat other than meat mentioned in the category above, and meat products derived from such meat, for HC

Products in category

This category includes:

- Fresh, chilled and frozen carcasses and meat. This can be bovine, pig, sheep, lamb, goat, horse, donkey or mule carcasses or meat. The meat can be either bone in or boneless
- Fresh, chilled and frozen bovine, pork, sheep, goat, horse, donkey, mule offal
- Salted, brined, dried or smoked cuts of pork, sheep, goat, or beef (including offal)
- Blood, meat or offal sausages, cooked or uncooked
- Liver products other than duck and goose liver
- Preparations of pork, beef, sheep and goat including cooked and uncooked preparations and preparations in airtight containers

Please note that this category excludes poultry products.

Expected conditions of intended use

Consumption data is available for this category, however intended use cannot be completely defined. The cooking of meat in this category may depend on the animal from which it is derived, for example meats from bovine and ovine animals may be more likely to be less-than-thoroughly cooked or consumed raw, such as rare or raw steak. Large joints of meat might include the bone which may be less-than-thoroughly cooked in the centre. Certain types of offal may also be less-than-thoroughly cooked in the centre. Therefore, consumption of raw meat may occur. FSA advice on consumption of less-than-thoroughly cooked meat is available [5]. Cured and preserved meats may not be intended for cooking unless specified for products which are cured but required cooking such as gammon and bacon. This category is likely to be included in home and imported recipes at various inclusion levels. Various population groups could be consumers.

Poultry meat products for HC

Products in category

This category includes prepared or preserved goose and duck liver. It also includes prepared or preserved turkey, chicken, goose, duck or guinea fowl meat and offal. These may be cooked or uncooked.

Expected conditions of intended use

Consumption data is available for this category. In most cases, foods in this category would be expected to be consumed fully cooked, however there may be circumstances in which this type of meat is consumed raw such as in the case of less-than-thoroughly cooked duck/goose or poultry liver. This may depend on the animal from which the product is derived e.g. duck or goose breasts are more likely to be less-than-thoroughly cooked. Cured and preserved meats may not be intended for cooking unless specified for products which are cured but required cooking. FSA advice on the cooking of poultry and consumption of less-than-thoroughly cooked meat is available [5]. This category is likely to be included in home and imported recipes at various inclusion levels. Various population groups could be consumers.

Poultry meat for HC

Products in category

This category includes fresh, chilled or frozen meat and offal. This can be from chicken, turkey, duck, goose and guinea fowl. The cuts can be bone-in or boneless. This category also includes duck and goose liver.

Expected conditions of intended use

Consumption data is available for this category. In most cases, foods in this category would be expected to be consumed fully cooked, however there may be circumstances in which this type of meat is consumed raw such as in the case of less-than-thoroughly cooked duck/goose or poultry liver. This may depend on the animal from which the product is derived e.g. duck or goose breasts are more likely to be less-than-thoroughly cooked. FSA advice on the cooking of poultry and consumption of less-than-thoroughly cooked meat is available [5]. This category is likely to be included in home and imported recipes at various inclusion levels. Various population groups could be consumers.

Rabbit meat, game meat, and their meat products for HC

Products in category

This category includes fresh, chilled and frozen meat and offal from rabbits, hares, primates, whales, seals, dolphins, porpoises, manatees, dugongs, reptiles, camelids, pigeons, quails, reindeer and other game. It also includes salted, brined, dried or smoked meat from the aforementioned categories, as well as edible flours and meals.

Expected conditions of intended use

Consumption data is available for this category, however intended used cannot be completely defined. The cooking of meat in this category may depend on the animal from which is derived, for example some game meats may be more likely to be less-than-thoroughly cooked or consumed raw, such as less-than-thoroughly cooked pigeon breasts. Therefore, consumption of raw meat may occur. FSA advice on consumption of less-than-thoroughly cooked meat is available [5]. Cured and preserved meats may not be intended for cooking unless specified for cured products which require cooking. This category us likely to be included in home recipes at various inclusion recipes in specific and fewer population groups.

Eggs for HC

Products in category

This category includes fresh eggs of domestic fowls, poultry and other birds in shell (excluding fertilised for incubation), eggs of poultry and other birds, in shell, preserved or cooked.

Expected conditions of intended use

Consumption data is available for this category. In most cases, foods in this category would be expected to be consumed cooked, however it is likely that they may not be fully cooked. Eggs consumed whole may be cooked but consumed with a soft yolk while in some cases they may be consumed raw. Furthermore, eggs intended for use in cooking such as meringues may be considered as less-than-thoroughly cooked due to low cooking temperature. Therefore, consumption of raw eggs cannot be ruled out. This category is likely to be included in a large number of home-made recipes where the eggs are cooked, particularly if from domestic birds. Raw eggs might be consumed by special population groups.

Egg products for HC which are preserved at frozen or chilled temperatures

Products in category

This category includes liquid egg yolks, frozen egg yolks and other egg yolks including frozen. It also includes egg albumin other than dried.

Expected conditions of intended use

For eggs which have been separated for sale and chilled, these are often pasteurised and used for specific recipes. Therefore, it would be expected that eggs in this category would be cooked as the intended use is likely to be for recipes. However, eggs intended for use in cooking such as meringues may be considered as less-than-thoroughly cooked due to low cooking temperature. This category is likely to be included in a large number of home-made recipes where the eggs are cooked, particularly if from domestic birds.

Egg products for HC, other than those mentioned in the two categories above

Products in category

This category includes egg albumin – dried and in other forms.

Expected conditions of intended use

Dried egg products may be pasteurised for sale. It would be expected that the eggs in this category would be cooked as the intended use is likely to be for recipes. However, eggs intended for use in cooking such as meringues may be considered as less-than-thoroughly cooked due to low cooking temperature.

Milk for HC

Products in category

This category includes milk and cream whether concentrated or not, sweetened or unsweetened, with a fat content by weight from < 1% to >45%.

Expected conditions of intended use

Consumption data is available for this category. In most cases, foods in this category would be expected to be heat treated. Liquid milk is imported into the UK in two forms, as raw milk for processing by dairies in the UK, or as liquid drinking

milk (e.g. pasteurised or UHT milk). Other intended uses, other than consumption as is in a mostly pasteurised state, would be hot beverages and cooked dishes. This category is likely to be included in a large number of home-made recipes. Consumption is less likely in infants below 12 months, as per NHS advice on consumption of cows' milk in infants [6]. However, whole cows' milk may give as a main drink from the age of 12 months, so young children may be high consumers.

Dairy products and colostrum-based products for HC, which are preserved at frozen or chilled temperatures

Products in category

This category includes:

- Yoghurt with or without added flavouring, sugar, fruit, nuts or cocoa powder or granules:fat content from 1.5% to 27%.
- Butter and other dairy spreads.
- Cheese made using milk from a range of species (e.g. cows, sheep, buffalo). Including fresh, fermented or processed cheese, whey cheese & curd, whether grated or powdered, blended, blue veined etc. Vacuum packed cheese. With or without rind.
- Natural milk constituents, with or without added sugar:protein from 1.5% to >27, fat content up to >42%.
- Products consisting of natural milk constituents, with added sugar, protein up to 27%, fat content up to 42%.
- Ice cream

Expected conditions of intended use

Consumption data is available for dairy products in this category. Pasteurisation of milk for production of foods in this category may depend on the type of food, for example some cheeses are made from unpasteurised milk. Many of these products will be intended to be eaten uncooked but will have been pasteurised, while others may not have been. Therefore, the consumption of raw dairy products may not be ruled out. Consumption is less likely in infants below 6 months, as per NHS advice on infant consumption of dairy products and solid foods [6]. Unpasteurised

dairy products, such as unpasteurised cheese, are unlikely to be eaten by infants and pregnant/ lactating women, as per NHS advice [6].

Dairy products and colostrum-based products for HC other than those mentioned in the category above

Products in category

This category includes:

- Milk and cream powder or granules, concentrated, with or without added sugar, fat content from 1.5% to 27%
- Milk powder or granules containing sugar, special for infants, in hermetically seal containers with fat content not exceeding 27%
- Milk albumin dried (e.g. in sheets, scales, flakes, powder)
- Whey and modified whey
- Fats and oils derived from milk, margarine
- Lactose and lactose syrup
- Cocoa powder
- Casein and casein derivatives

Expected conditions of intended use

Dried milk and milk products are expected to have been pasteurised for sale. Intended use is likely to be in recipes or as milk drinks or foods for infants. In which case, pasteurisation and/or cooking would be expected.

Rendered animal fat and greaves for HC

Products in category

This category includes:

- Pig fat; lard, rendered or otherwise extracted (excl. for technical/industrial uses)
- Pig fat; not lard, rendered or otherwise extracted (excl. for technical /industrial uses, and lard)
- Poultry fat; rendered or otherwise extracted
- Fats of bovine animals, sheep or goats (excl. for technical/industrial uses)

- Tallow
- Lard stearin, lardoil, oleostearin, lard oil, oleo oil
- Fish liver oils and their fractions
- Marine mammal fats, oils and their liquid fractions

Expected conditions of intended use

Limited consumption data is available for this category. It is considered likely that foods in the group are intended to be used for cooking either at high temperatures or as an ingredient in baking. However, it cannot be ruled out that some of these foods may be used as spreads and therefore not used in cooking. The processing of these fats in order to render them from the whole animal and store them is likely to involve heating. This category is likely to be included in home and imported recipes at various inclusion levels. Various population groups could be consumers.

Honey and other apiculture products for HC

Products in category

This category includes natural honey, artificial honey whether or not mixed with natural honey, beeswax, other insect waxes and spermaceti.

Expected conditions of intended use

Consumption data is available for honey and honey products. Many types of honey are pasteurised, although many aren't. The intended use for honey is likely to be eaten as is or in cooking. Whereas bee pollen, royal jelly and propolis are often marketed as a health supplement so is likely to be consumed without cooking or further processing. Honey is likely to be included in home and imported recipes at various inclusion levels. Various population groups could be consumers. However, other apiculture products will be more likely consumed by specific population groups.

Frog legs and snails for HC

Products in category

This category includes:

- Fresh, chilled or frozen frogs' legs
- Snails, other than sea snails, smoked, even in shell, even cooked but not otherwise prepared, live, fresh, chilled, frozen, salted, dried or in brine, even in shell prepared or preserved (excluding smoked)

Expected conditions of intended use

Limited consumption data is available for these products. Many types of these products will be imported in a processed form such as canned or dried, so would be intended for consumption as is. Products which are imported raw are considered very likely to be intended for cooking. This category is likely to only be consumed by specific population groups.

Insects for HC

Products in category

There is no definitive list of insects for HC. However, the two most relevant species for human consumption are the mealworm or yellow mealworm (*Tenebrio molitor*), and the house cricket (*Acheta domesticus*). There are other relevant ones like lesser mealworm (*Alphitobius diaperinus*), the giant mealworm (*zophobas atratus*), banded cricket (*Gryllodes sigillatus*) and various locust species, African migratory locust, desert locust, and the American grasshopper. The mealworm group will additionally be particularly relevant for foods made from ground insects (pasta, biscuits, etc), although some cricket species will also receive this treatment. The majority of products, whether whole insect or powdered etc, will be dried or fried or heat-treated.

Expected conditions of intended use

Most insect products are likely to be imported already processed which would involve drying or cooking as these are mostly marketed as exotic snacks similar in flavour to nuts, seeds or crisps. Others would be powdered so will have gone through a drying process. Therefore, they are likely to be intended to be consumed as is or to use as a powder in recipes. No NDNS data is available for these. Insects are often considered a novel food as they have less than 25 years of proven consumption in the UK, therefore they must present an application for

authorisation if the product, which ensures safety. Fewer population groups are likely to be consumers.

Gelatine and collagen for HC

Products in category

This category includes gelatine and collagen.

Expected conditions of intended use

The process of extracting gelatine from animals is through the use of high temperatures. Gelatine would be intended to be used in recipes such as jellies where the flavoured product is heated to incorporate the gelatine and then set. Collagen tends to be extracted chemically and would be intended to be consumed dried in capsule or tablet supplements. Gelatine is likely to be included in home and imported recipes at various inclusion levels. Various population groups could be consumers. Fewer population groups are likely to be consumers of collagen products.

Highly refined products for HC

Products in category

This category includes chondroitin sulphate, hyaluronic acid, other hydrolysed cartilage products, chitosan, glucosamine, rennet, glues of animal origin, isinglass, enzymes, amino acids authorised as additives, cysteine/cystine and their derivatives.

Expected conditions of intended use

Rennet is chemically extracted and would be intended for use in the making of cheeses which will involve minimal heating of the milk to activate the protein. Amino acids of animal origin are likely to be used in supplements and the intended use of other products in this category is unknown. Cheeses made using rennet are likely to be included in home and imported recipes at various inclusion levels. Various population groups could be consumers, excluding vegetarian and

plant-based groups. Population groups consuming other products in this category may be fewer, but this is unknown.

Fishery products from aquaculture and bivalve molluscs for HC, which are not in hermetically sealed containers intended to render them stable at ambient temperature

Products in category

This category includes:

- Fresh, chilled or frozen trout, salmon, tuna, carp, seabream, tilapias, catfish and eels
- Molluscs, mussels, scallops, oysters, clams, cockles, ark shells and abalone. These include whether in shell or not, live, fresh or chilled, frozen, dried, salted or in brine, unsmoked or smoked, cooked or not before or during the smoking process, cooked but not otherwise prepared

Expected conditions of intended use

Consumption data is available for this category. In the UK it is expected that many of the foods in this category would be intended to be cooked. However, this may depend on the type of fish or seafood, for example fresh tuna is more likely to be consumed raw or less-than-thoroughly cooked, as are other fish commonly used in sushi such as salmon. Furthermore, molluscs like oysters are commonly eaten in their raw state. Therefore, it may not be uncommon for foods in this category to be eaten raw. FSA advice on raw fish and seafood preparation is available [7] as freezing requirements apply for food businesses to fish and fishery products intended to be consumed raw or lightly cooked. NHS advice on the consumption of fish and seafood is also available [8]. Consumption of raw-or-less-than-thoroughly cooked fish and seafood may vary on seasons and populations groups, the high cost of many of these products may stop many groups from eating them frequently. Furthermore, young children and pregnant/ lactating women are less likely to consume raw fish and seafood products, as per NHS advice on fish and seafood [8]. Additionally, young children and pregnant/ lactating women may also

eat less of certain types of fish (e.g. shark, oily fish, tuna) than other population groups due to high levels of mercury, as per NHS advice on fish and seafood [8].

Fishery products other than those mentioned in the category above

Products in category

This category includes:

- Fresh, chilled or frozen saltwater fish such as halibut, salmon, plaice, sole, tuna, sardines, bonito, herring, anchovies, mackerel, swordfish, cod, haddock, hake, catfish, monkfish, sea bass, dogfish and other sharks
- Live, fresh, chilled or frozen lobster and other sea crawfish, crabs, cuttlefish, octopus, squid, sea cucumbers, sea urchins, jellyfish.
- Smoked, cooked, dried, salted fish or crustaceans, and products such as fish fillets, roes, caviar, minced fish meat, shark fin, and flours made from fish.
- Prepared or preserved fish, crustaceans, octopus, squid, sea cucumbers, sea urchins, jellyfish, oysters, mussels, scallops, clams, cockles, ark shells and abalone, which are not covered by the category above

Expected conditions of intended use

Consumption data is available for this category. Foods in this group are likely to be intended to be eaten as they are or used in recipes. The process through which they have already gone is likely to render them safe to eat without cooking. This category may be included in home and imported recipes at various inclusion levels. Fewer population groups are likely to be consumers.

Annex 2: Legislation relating to physical checks carried out on POAO

- Reg 2073/2005 on the microbiological criteria for foodstuffs
- Reg 333/2007: laying down the methods of sampling and analysis for the official control of the levels of lead, cadmium, mercury, inorganic tin, 3-MCPD and benzo(a)pyrene in foodstuffs
- Reg 644/2017: laying down methods of sampling and analysis for the control of levels of dioxins, dioxin-like PCBs and non-dioxin-like PCBs in certain foodstuffs
- Reg 401/2006: laying down the methods of sampling and analysis for the official control of the levels of mycotoxins in foodstuffs
- Reg 1881/2006: setting maximum levels for certain contaminants in foodstuffs
- Reg 315/93: contaminants in food (and which includes contaminants not specified elsewhere e.g. arsenic or specific dyes)
- Reg 470/2009: the establishment of residue limits of pharmacologically active substances in foodstuffs of animal origin
- Reg 37/2010: on permitted vet residues and their classification regarding maximum residue limits in foodstuffs of animal origin
- Decision 2005/34 on banned vet residues – reference points of action for Chloramphenicol, Medroxyprogesterone acetate, Nitrofuran metabolites, Malachite green etc
- Reg 1333/2008 on food additives
- Reg 396/2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin
- Reg 853/2004: laying down specific hygiene rules for on the hygiene of foodstuffs (and which includes other residues)
- Reg 853/2004: laying down specific hygiene rules for food of animal origin (and which includes marine biotoxin

Annex 3: Provisional Scores

An example of a table of provisional scores created for a product category is shown in Table 5.

Table 5: Example of a table of individual experts' questionnaire scores and provisional overall scores for each product category which was produced before the workshop

Risk category	N	N	VL	VL	VL/L	VL/L	L	L	M	M	H	H	VH	VH	Provisional score	Consensus
Confidence	L	H	L	H	L	H	L	H	L	H	L	H	L	H	-	-
Microbiological pathogens	1	0	0	1	1	0	0	1	1	1	0	2	0	1	High	High
Biotoxins	2	2	0	0	1	1	0	0	0	0	0	0	0	0	Negligible	Negligible
Chemical contamination	0	0	0	0	0	2	2	2	0	1	0	1	0	0	Low	Low

N= negligible, VL = very low, VL/L very low/low, L = Low, M = Medium, H=High, VH=Very High

Provisional overall scores were created by combining all of the experts' responses from their questionnaire responses. This was done to act as a starting point for discussion for each of the product categories during the expert elicitation workshop. The provisional scores for each product category/hazard group combination were created using the following rules:

1. The focus was on the scores where the experts rated their level of confidence for their score for that product group/hazard group combination as medium or high. The criteria for the experts' confidence in their scores were as follows:
   - Low (e.g. no direct experience, some reading and anecdotal knowledge only)
   - Medium (e.g. some direct experience, but wide reading), or:
   - High (e.g. extensive direct experience)

2. Where an expert had given a likelihood category score of Very Low/Low, the score was decided by the number of scores by the other experts in the adjacent Very Low and Low categories. This was because the preference was to avoid using a combined Very Low/Low category and instead estimate likelihood as either Very Low or Low when using the individual experts' scores to produce the overall provisional scores for each product category.

3. The overall provisional score was assigned based on ensuring more than 50% of the scores from individual experts were within that category or lower. This was to ensure a degree of caution when assessing likelihood

4. When there was a tie in the questionnaire responses, the scores from experts who assessed their level of confidence for that product group/hazard group as low were considered in order to assign a provisional score.

5. The strength of individual justifications was not taken into consideration when producing the provisional scores.

Results

A summary of the outputs from the analysis was circulated to the expert panel before the workshop to allow time for the experts to reflect on each other's scores and justifications and consider whether their own scores needed to be adjusted during the workshop.

The provisional scores for each product category and hazard group are shown in table 5. These are based on the scores provided separately by the expert panel members in the on-line assessment questionnaire before the workshop. Please note that these are not the final scores.

Table 5: Provisional scores for each product category and hazard group

(please note that these are not the final scores)

POAO category	Hazard group	Provisional score	Overall score
Minced meat, mechanically separated meat and meat preparations for human consumption HC	Microbiological pathogens	High	High
Minced meat, mechanically separated meat and meat preparations for human consumption HC	Biotoxins	Negligible	High
Minced meat, mechanically separated meat and meat preparations for human consumption HC	Chemical contamination	Low	High
Meat other than meat mentioned in the category above, and meat products derived from such meat, for HC	Microbiological pathogens	Medium	Medium
Meat other than meat mentioned in the category above, and meat products derived from such meat, for HC	Biotoxins	Very Low	Medium
Meat other than meat mentioned in the category above, and meat products derived from such meat, for HC	Chemical contamination	Low	Medium
Poultry meat products for HC	Microbiological pathogens	High	High
Poultry meat products for HC	Biotoxins	Very Low	High
Poultry meat products for HC	Chemical contamination	Low	High
Poultry meat for HC	Microbiological pathogens	High	High
Poultry meat for HC	Biotoxins	Very Low	High
Poultry meat for HC	Chemical contamination	Low	High
Rabbit meat, game meat, and their meat products for HC	Microbiological pathogens	Medium	Medium

Rabbit meat, game meat, and their meat products for HC	Biotoxins	Very Low	Medium
Rabbit meat, game meat, and their meat products for HC	Chemical contamination	Medium	Medium
Eggs for HC	Microbiological pathogens	Medium	Medium
Eggs for HC	Biotoxins	Very Low	Medium
Eggs for HC	Chemical contamination	Low	Medium
Egg products for HC which are preserved at frozen or chilled temperatures	Microbiological pathogens	Medium	Medium
Egg products for HC which are preserved at frozen or chilled temperatures	Biotoxins	Very Low	Medium
Egg products for HC which are preserved at frozen or chilled temperatures	Chemical contamination	Medium	Medium
Egg products for HC, other than those mentioned in the two categories above	Microbiological pathogens	Low	Medium
Egg products for HC, other than those mentioned in the two categories above	Biotoxins	Very Low	Medium
Egg products for HC, other than those mentioned in the two categories above	Chemical contamination	Medium	Medium
Milk for HC	Microbiological pathogens	Medium	Medium
Milk for HC	Biotoxins	Very Low	Medium
Milk for HC	Chemical contamination	Low	Medium
Dairy products and colostrum-based products for HC, which are preserved at frozen or chilled temperatures	Microbiological pathogens	High	High

Dairy products and colostrum-based products for HC, which are preserved at frozen or chilled temperatures	Biotoxins	Very Low	High
Dairy products and colostrum-based products for HC, which are preserved at frozen or chilled temperatures	Chemical contamination	Low	High
Dairy products and colostrum-based products for HC other than those mentioned in the category above	Microbiological pathogens	Medium	Medium
Dairy products and colostrum-based products for HC other than those mentioned in the category above	Biotoxins	Very Low	Medium
Dairy products and colostrum-based products for HC other than those mentioned in the category above	Chemical contamination	Low	Medium
Rendered animal fat and greaves for HC	Microbiological pathogens	Very Low	Very Low
Rendered animal fat and greaves for HC	Biotoxins	Very Low	Very Low
Rendered animal fat and greaves for HC	Chemical contamination	Very Low	Very Low
Honey and other apiculture products for HC	Microbiological pathogens	Very Low	Low
Honey and other apiculture products for HC	Biotoxins	Very Low	Low
Honey and other apiculture products for HC	Chemical contamination	Low	Low
Frogs legs and snails for HC	Microbiological pathogens	Low	Low
Frogs legs and snails for HC	Biotoxins	Very Low	Low
Frogs legs and snails for HC	Chemical contamination	Low	Low
Insects for HC	Microbiological pathogens	Very Low	Low
Insects for HC	Biotoxins	Very Low	Low

Insects for HC	Chemical contamination	Low	Low
Gelatine and collagen for HC	Microbiological pathogens	Negligible	Low
Gelatine and collagen for HC	Biotoxins	Very Low	Low
Gelatine and collagen for HC	Chemical contamination	Low	Low
Highly refined products for HC	Microbiological pathogens	Very Low	Very Low
Highly refined products for HC	Biotoxins	Very Low	Very Low
Highly refined products for HC	Chemical contamination	Very Low	Very Low
Fishery products from aquaculture and bivalve molluscs for HC, which are not in hermetically sealed containers intended to render them stable at ambient temperature	Microbiological pathogens	High	High
Fishery products from aquaculture and bivalve molluscs for HC, which are not in hermetically sealed containers intended to render them stable at ambient temperature	Biotoxins	High	High
Fishery products from aquaculture and bivalve molluscs for HC, which are not in hermetically sealed containers intended to render them stable at ambient temperature	Chemical contamination	Low	High
Fishery products other than those mentioned in the category above	Microbiological pathogens	High	High
Fishery products other than those mentioned in the category above	Biotoxins	High	High
Fishery products other than those mentioned in the category above	Chemical contamination	Medium	High

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