Market Advisory Council

Advice

Maximum Sulphites Levels for Crustaceans

Brussels, 27 July 2022

1. Background

The implementation of sanitary and food hygiene rules plays an important role in the EU market of fishery and aquaculture products, ensuring confidence in the supply chain and among consumers. Under the Work Programme for Year 6 (2021-2022), the MAC committed to monitoring sanitary and hygiene rules relevant to seafood, such as food safety management, contaminants and additives. In this context, the MAC would like to request a modification of the regulatory maximum limits of sulphites in Shrimps and Norway Lobster (*Families Penaeidae, Solenoceridae and Aristeidae and Nephropidae*), currently regulated by Regulation (EC) No 1333/2008 on food additives[1].

2. Economic importance of cooked crustaceans

According to information extracted from Eurostat's Comext[2], in 2020, in 1000 tonnes, the following amounts of crustaceans were imported and exported:

EU 27-2020	IMPORT	EXPORT	BALANCE
All CRUSTACEANS	508	104	404
Of which FROZEN PENAEUS	270	78	192

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02008R1333-20210808
[2] http://epp.eurostat.ec.europa.eu/newxtweb/

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3. Use of sulphites

The developments of the phenomenon of post-mortem melanosis observed in crustaceans, and particularly shrimps and Norway lobsters, has a significant impact on the shelf life and the overall commercial value of the products. This phenomenon of melanosis results from enzymatic activities [phenoloxidase (tyrosinase)] catalysing irreversible oxidation reactions of the free tyrosine present in the tissues, resulting in the appearance of black spots on the crustaceans. To limit this process, non-living shrimps and Norway Lobsters under ice are treated with sodium metabisulphite (E223). This operation inhibits the action of polyphenoloxidases and therefore stops the appearance of melanosis.

4. Modes of treatment of crustaceans with sulphites[3]

The most common practices are spraying and soaking: the products are sprayed and soaked in a solution of sodium metabisulphite at the lowest possible concentration to achieve the desired effect taking into account the applied process. The technique of dusting with metabisulphite also exists but does not allow achieving a good regularity and is thus not advised.

To be effective and minimise the use of sodium metabisulphite, this operation is performed as soon as possible after catching or harvesting. This is why it is usually carried out directly on fishing boats or after harvest for farmed crustaceans. For the latter, the treatment is carried out most often at the edge of the ponds, before the sorting of prawns by size.

[3] See Guide for good hygiene practices for cooked crustaceans of July 2016, GBPHCC: https://agriculture.gouv.fr/telecharger/128703?token=7fc2130e9614bc4a4013a3bd13c4246d273e4293c583adb0a15085e5c01d1ba8

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The sulphites concentration of the treatment solution for soaking or spraying and the temperature of the bath or the spraying solution are precisely controlled. Treatment is following by rinsing. Therefore, sulphites are found mainly on the crustacean's surface, on the shell.

To limit the risks associated with the use of sulphites, a set of preventive measures has been implemented by the stakeholders:

- Raw materials (raw crustaceans):
    - Supplier specifications are established: the suppliers are also qualified in relation to the sulphiting conditions on board or at the level of the ponds and the conditions of conservation of the products;
    - For sulphiting on board or at the edge of ponds, the technique is clearly defined (sulphite dusting is prohibited by the hygiene guide), the amount of sulphites used must be controlled as the residual sulphites content in the product;
    - The rinsing technique on crustaceans is also monitored (rinsing in static tanks filled with water is prohibited);
    - Raw materials are checked upon receipt;
    - In case of new supplier, the control is strengthened.
- Concerning the sulphites used:
    - Sulphite specifications are established: the purity criteria for food additives for the used raw material must be respected, and the manufacturing processes must be validated;
    - Regarding the concentration of the sulphite's solution, it is recommended to use the minimum possible concentration to obtain the desired effect. In the case of secondary sulphiting in a cooking establishment, sulphiting of the raw material is taken into account.

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- Concerning the sulphiting operation: the processes used are validated (instructions, training of personnel). The sulphiting can take place at different times, in different places, or after cleaning, etc. The techniques are soaking or spraying. The duration of the sulphiting is precise and controlled. A rinse is performed.

The whole process is well mastered. Potential risks are identified and controlled by the operators. Many checkpoints are established. The use of sodium metabisulphite represents some advantages in terms of ease of use, low hazard and from an economic point of view. There is currently no commercially viable alternative.

5. Sulphites' analysis method

The current official method is the Monier Williams method (included in the NF EN 1988-1 standard of April 1998[4]), a distillation method. There are alternative methods that are quicker and cheaper, allowing to perform more analyses. Most of them are enzymatic methods. In the case of positive results, verification by the official method is nevertheless necessary.

The most significant analytical challenge is the preparation of the samples (whatever the method of assay used): the defrosting and shelling are delicate because there is a risk of flesh contamination. In addition, difficulties are added at the sampling level: a high heterogeneity of contamination from one individual to another can be noted because of the biology of each specimen (for example, the shell conditions compared to the moulting stage), which results in often poorly reproducible results.

[4] https://www.boutique.afnor.org/fr-fr/norme/nf-en-19881/produits-alimentaires-dosage-des-sulfites-partie-1-methode-optimisee-de-mon/fa041070/13794

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6. Sulphites' analysis method

Regulation (EC) 1333/2008 sets the maximum limits currently allowed in the different products:

E-number	Name	Maximum level (in mg / l or mg / kg as appropriate)	Restrictions / exceptions
09.1.2 Unprocessed molluscs and crustaceans			
E220 - E228	Sulphur dioxide - Sulphites	150 (3) (10)	Only fresh, frozen and deep-frozen crustaceans and cephalopods; crustaceans of the Penaeidae, Solenoceridae and Aristaeidae family up to 80 units per kg
E220 - E228	Sulphur dioxide - Sulphites	200 (3) (10)	Only crustaceans of the Penaeidae, Solenoceridae and Aristaeidae family between 80 and 120 units per kg
E220 - E228	Sulphur dioxide - Sulphites	300 (3) (10)	Only crustaceans of the Penaeidae, Solenoceridae and Aristaeidae family over 120 units per kg
09.2 Processed fish and fishery products, including molluscs and crustaceans			
E220 - E228	Sulphur dioxide - Sulphites	50 (3) (10)	Only cooked crustaceans and cephalopods
E220 - E228	Sulphur dioxide - Sulphites	135 (3) (10)	Only cooked crustaceans of the Penaeidae, Solenoceridae and Aristaeidae family up to 80 units per kg
E220 - E228	Sulphur dioxide - Sulphites	180 (3) (10)	Only cooked crustaceans of the Penaeidae, Solenoceridae and Aristaeidae family between 80 and 120 units per kg
E220 - E228	Sulphur dioxide - Sulphites	270 (3) (10)	Only cooked crustaceans of the Penaeidae, Solenoceridae and Aristaeidae family over 120 units per kg

(3): Maximum levels are expressed as SO_2 relate to the total quantity, available from all sources, an SO2 content of not more than 10 mg/kg or 10 mg/l is not considered to be present

(10): Maximum limits in edible parts

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For Norway Lobsters: the maximum quantity authorized for raw products is 150 mg / kg, but only 50 mg / kg for cooked products. For shrimps: there are a difference of 10% between the maximum quantities authorized for raw products and cooked products and a great variability of the maximum quantities authorized according to the sizes.

7. Health risk: Toxicity of sulphites[5]

The major risk to health is that of intolerance for sensitive people (appearance of headaches, etc.). It should be noted that the hazard associated with sulphites is generated by two distinct causes: quality of metabisulphite used (compliance with the purity criteria for food additives, see Reg. (EU) 231/2012), and the use rates. The danger is well controlled by professionals, particularly through the implementation of a guide of good hygiene practices for cooked shellfish.

The current Acceptable Daily Intake (ADI), defined in 2016 by the European Food Safety Authority (EFSA), is 0.7 milligrams per kilogram of body weight of SO_2 and covers the eight combined substances (E220 to E228). The EFSA Expert Panel on Food Additives recommends that this temporary pooled ADI be re-evaluated in the next five years after further studies to supplement existing data. The Panel also suggests that labeling include a description of the actual level of sulphites / sulfur dioxide in individual products to help sensitive / intolerant consumers regulate their consumption. Current EU legislation requires food labeling to indicate "contains sulphites" when it exceeds 10 milligrams per kilogram or liter, but does not specify the exact amount.

Taking into account this ADI, here is a table presenting, as an example, the maximum ingestible quantities per day according to the weight of the individual and the maximum limits allowed:

[5] See 2016 EFSA Opinion: https://www.efsa.europa.eu/en/efsajournal/pub/4438.

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		Maximum allowable limit, expressed in SO_2 (mg/kg)		
Individual weight (kg)	Ingestible sulphite dose / day (mg)	50	150	200
50	35	**700**	**233**	**175**
70	49	**980**	**327**	**245**
100	70	**1400**	**467**	**350**

Thus, whatever the maximum allowed limits and for different weights of individuals, the maximum ingestible amount per day remains satisfactory.

8. Problems encountered by cooking establishments

- Case of Norway lobster

Cookers face difficulty to obtain cooked Norway Lobsters with a sulphite content of less than 50 mg / kg. In 2017, a data collection conducted by the technical board showed a rate of exceedance of the maximum limit for 21.5% of lots for cooked Norway Lobster while it was only 5.8% for raw Norway Lobsters.

Norway Lobster - RAW	
Number of samples	190
0-50 mg/kg	139
50-150 mg/kg	40
> 150 mg/kg	11
% non-compliant	**5,8%**

Norway Lobster - COOKED	
Number of samples	144
0-50 mg/kg	113
> 50 mg/kg	31
% non-compliant	**21,5%**

Moreover, since the maximum limit allowed in the raw product is 150 mg/kg, some raw batches whose level is between 50 and 150 mg/kg, although in compliance with the regulations, are

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refused upon receipt by the professionals because they would end up non-compliant after cooking. The difference between the maximum permitted thresholds in raw products (150 mg/kg) and in cooked products (50 mg/kg) is the reason of these difficulties. Aligning the maximum allowed limit of cooked products with that of raw products (i.e., 150 mg/kg) would thus allow to be closer to the reality, to remove an inconsistency and to simplify the regulation; considering that no Norway lobster will be eaten raw, the modification of the threshold will not increase the overall exposure of the consumers to sulphites.

- Case of shrimp

For raw and cooked shrimps, the maximum permissible thresholds vary according to size, with a higher authorized level for small sizes[6] (historical thresholds: see the European Parliament and Council Directive 95/2/EC of 20 February 1995 on food additives other than colours and sweeteners). In addition, there is a 10% difference in the allowed rate between raw and cooked products (the allowed rate is higher for raw products than for cooked products).

The modification of the maximum permissible limits to harmonize the differences between raw and cooked products and the removal of variations related to sizes would thus allow to be closer to the reality, to remove an inconsistency and to simplify the regulation; considering that no shrimp will be eaten raw, the modification of the threshold will not increase the overall exposure of the consumers.

[6] For historical thresholds, see European Parliament and Council Directive No 95/2/EC of 20 February 1995 on food additives other than colours and sweeteners.

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9. Recommendation

Considering that

- no shrimp or Norway lobster will be eaten raw,
- the overall exposure of consumers to sulphites will not be increased by the proposal,
- and assuming that the risk of exceeding the maximum intake for individuals still is limited

the MAC believes that the Commission should modify the regulatory thresholds as follows:

- Norway Lobsters:

	Maximum level (mg/kg) for Norway lobster according to Regulation (EC) No 1333/2008	Maximum level (mg/kg) for Norway lobster according to Regulation (EC) No 1333/2008
	RAW	COOKED
Current thresholds	150	50
Suggested thresholds	**150**	**150**

- Shrimps:

	Size (number of pieces/kg)	Maximum level (mg/kg) for shrimps according to Regulation (EC) No 1333/2008	Maximum level (mg/kg) for shrimps according to Regulation (EC) No 1333/2008
		RAW	COOKED
Current thresholds	< 80	150	135
	80-120	200	180
	> 120	300	270

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Suggested thresholds	**All sizes**	**200**	**200**

10. Bibliography

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