

Supporting document 1

Risk and technical assessment report (at Approval)

Application A1088 – Sodium Hydrosulphite as a Food Additive

Executive Summary

FSANZ received an Application from Seafood New Zealand Limited seeking to amend Standard 1.3.1 – Food Additives of the *Australia New Zealand Food Standards Code* (the Code) to permit the addition of sodium hydrosulphite as a food additive in canned abalone.

Sulphur dioxide and six sulphite compounds are currently permitted as food additives in canned abalone at a maximum permitted level (MPL) of 1000 mg/kg, calculated as sulphur dioxide. For the proposed use of sodium hydrosulphite in canned abalone, this Application requests an identical MPL of 1000 mg/kg, calculated as sulphur dioxide.

The food technology assessment concluded that sodium hydrosulphite fulfils the stated technological function as a food additive antioxidant with bleaching properties at the proposed level of use. Sodium hydrosulphite bleaches the black colour of native New Zealand abalone (paua) to a golden blonde to nutmeg colour which is more acceptable to the consumer and prevents subsequent oxidation and discolouration during shelf life, especially for the international market.

The Application indicated that sodium hydrosulphite is the most effective compound available to produce a canned abalone product with acceptable organoleptic properties.

During the processing of canned abalone, the hydrosulphite anion ($S_2O_4^{2-}$) undergoes chemical decomposition to produce the same chemical species that result from use of the other approved sulphites, with the sulphite anion (SO_3^{2-}) as the predominant form and a minor proportion as the bisulphite anion (HSO_3^-). No residual hydrosulphite anion is detectable in the final canned product. Therefore, the use of sodium hydrosulphite in the production of canned abalone will not result in dietary exposure to a new food additive or additional dietary exposure to sulphites.

FSANZ is currently conducting a risk assessment of sulphites in the Australia New Zealand food supply as part of Proposal P298 - Benzoate and Sulphite Permissions in Food. The sulphite permissions for canned abalone are not under review in that Proposal because consumption of canned abalone is very low compared to foods that are the major contributors to total dietary exposure to sulphites.

Some individuals are sensitive to sulphites (e.g. asthmatics) and this will also be the case for sodium hydrosulphite. The Code requires the mandatory declaration of sulphites in the statement of ingredients when added to foods in concentrations of 10 mg/kg or more.

It is concluded that the use of sodium hydrosulphite as a food additive in canned abalone is technologically justified and presents no identifiable public health and safety issues above those of the sulphite food additives currently permitted in canned abalone.

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1. INTRODUCTION

On the 7 June 2013, Food Standards Australia New Zealand (FSANZ) received an Application from Seafood New Zealand Limited seeking to amend Standard 1.3.1 – Food Additives of the *Australia New Zealand Food Standards Code* (the Code) to permit the addition of sodium hydrosulphite to canned abalone as a food additive.

Standard 1.3.1 currently permits the following food additives for use in canned abalone at a maximum permitted level (MPL) of 1000 mg/kg, calculated as sulphur dioxide: sulphur dioxide (INS no. 220), sodium sulphite (221), sodium bisulphite (222), sodium metabisulphite (223), potassium metabisulphite (224), potassium sulphite (225) and potassium bisulphite (228). For the proposed use of sodium hydrosulphite in canned abalone, this Application requests an identical MPL of 1000 mg/kg, calculated as sulphur dioxide.

1.1 Risk assessment context

For the purpose of this risk assessment, the proposed addition of sodium hydrosulphite to canned abalone in Australia and New Zealand will be considered in the context of the following:

- Sodium hydrosulphite is proposed as an alternative to sulphites currently approved for use in canned abalone;
- The proposed MPL of 1000 mg/kg, expressed as sulphur dioxide, is identical to the existing MPL for sulphites.

1.2 Risk and Technical Assessment questions

For this Application, the risk assessment questions were developed in the context of the Section 18 Objectives of the *Food Standards Australia New Zealand Act 1991*.

The following risk assessment questions are addressed in this report:

1. Does sodium hydrosulphite achieve its technological function in the form and quantity used as a food additive for canned abalone?
2. Are there any public health and safety issues associated with the use of sodium hydrosulphite as a food additive for canned abalone?

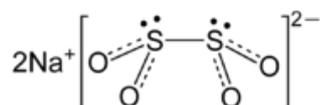
2. FOOD TECHNOLOGY ASSESSMENT

Sodium hydrosulphite is proposed as an alternative food additive to be used in the processing of canned New Zealand abalone to bleach the natural black colour to the more commercially acceptable golden blonde to nutmeg colour, especially for the export market. Sodium hydrosulphite has preservative, antioxidant and bleaching properties. It is not currently permitted for this purpose in the Code, nor is it a Codex Alimentarius permitted food additive. However, it is permitted to perform a similar function in other countries' food regulations. The Code permits a number of other sulphite food additives for treating canned abalone, but it is claimed they do not bleach the colour of New Zealand abalone to a commercially acceptable extent compared to sodium hydrosulphite.

2.1 Characterisation of sodium hydrosulphite

2.1.1 Identity

Common name:	Sodium hydrosulphite
Other names:	Sodium dithionite; disodium hydrosulphite; dithionous acid, disodium salt; sodium hyposulphite; sodium sulfoxilate
C.A.S. registry number:	7775-14-6
INS number:	Not Applicable (does not have an official Codex Alimentarius food additive INS number)
Structural formula:	$\text{Na}_2\text{S}_2\text{O}_4$
Molecular weight:	174.1 g/mol
Molecular structure:	



2.1.2 Chemical and physical properties

Sodium hydrosulphite is a strong reducing agent. It is very soluble in aqueous solution whereupon the hydrosulphite anion ($\text{S}_2\text{O}_4^{2-}$) undergoes decomposition to produce the same chemical species that result from use of the other approved sulphites (depending on pH), namely hydrogen sulphite (HSO_3^-), sulphite (SO_3^{2-}), hydrogen sulphate (HSO_4^-), sulphate (SO_4^{2-}) and sulphur dioxide (SO_2).

Dobson (2011) stated that canned abalone has a pH in the range 6.0 – 6.5, and in this pH range the majority of free sulphite is in the form of the sulphite anion (SO_3^{2-}), with a minor proportion as the bisulphite anion (HSO_3^-). Sulphur dioxide (SO_2) does not occur in solution in this pH range, and is only found in sulphite solutions when the pH is below 4.0 and becomes the predominant form when the pH is < 2.0 (Green 1976).

An unpublished report provided in the Application indicated that the hydrosulphite anion which results from the initial dissolution of sodium hydrosulphite in aqueous solution was not detectable in the final canned abalone product (Harding et al 2011).

The chemical and physical properties of sodium hydrosulphite are provided in the following table.

Property	Value
Physical state at room temperature	White powder
Melting point	Decomposes above 90°C
Boiling point	Not applicable
Relative density	2.38 g/cm ³ (at 20°C)
Vapour pressure	Not applicable
Water solubility	Approx. 182 g/L (at 20°C)
Partition coefficient n-octanol/water (log value)	Less than -4.7

2.1.3 Production of sodium hydrosulphite

Since sodium hydrosulphite is relatively unstable it is usually stabilised with sodium carbonate and sodium sulphite, which are generally permitted food additives, at about 20% of the total preparation. Both of these extra food additives are already permitted to be added to canned abalone.

2.1.4 Specifications

There is no specification for sodium hydrosulphite in either of the primary sources of specifications in Standard 1.3.4 – Identity and Purity (i.e. not in the JECFA (Joint FAO/WHO Expert Committee on Food Additives) Combined Compendium of Food Additive Specifications or the Food Chemicals Codex). However, there is a specification for sodium hydrosulfite (alternative spelling) in the Japanese Specifications and Standards for Food Additives (7th Edition, 2000) which is a secondary source of specifications in clause 3 of Standard 1.3.4. Therefore, no specification for sodium hydrosulphite is required to be written into the Schedule for Standard 1.3.4. Sodium hydrosulphite is permitted as a food additive in Japan to treat a range of different foods.

2.1.5 Methods of analysis in foods

Official methods based on the original Monier-Williams method are appropriate for the determination of sulphites in canned abalone (e.g. Hillery et al 1989).

2.2 Technological function of sodium hydrosulphite

Sodium hydrosulphite has the technological function as a preservative, antioxidant and bleaching agent like the other sulphiting agents which are already permitted in the Code for addition to various food categories including canned abalone. Sodium hydrosulphite is a strong reducing agent.

Treatment of abalone with sodium hydrosulphite occurs prior to canning. The Application explains that other sulphiting agents (INS 220, 221, 222, 223, 224, 225 and 228), which are already permitted in the Code to treat canned abalone, are not as effective as bleaching agents. Massey University in New Zealand was commissioned by a commercial paua processing company to investigate alternative bleaching agents to sodium hydrosulphite but the researcher concluded that there were no suitable alternatives in terms of product quality, colour, flavour and texture in the resulting canned abalone product. FSANZ has no reason to disagree with this conclusion.

2.2.1 Food additive or processing aid function

Sulphites are permitted food additives with the technological functions of preservative and antioxidant in Schedule 1 of Standard 1.3.1 – Food Additives for the treatment of various foods. A number of them are also permitted as bleaching agent processing aids in Table 12 of Standard 1.3.3 – Processing Aids. This risk assessment addresses which function is appropriate for sodium hydrosulphite for the current proposed purpose of the Application.

All sulphites are strong reducing agents or antioxidants which have bleaching function. The extent of bleaching is dependent on the amount added and the strength of the reducing properties. Sodium hydrosulphite, being a strong reducing agent, is considered a strong antioxidant with bleaching properties.

Sulphites, including sodium hydrosulphite, are added as antioxidants to prevent the oxidation of blood pigment (haemocyanin) (Dobson, 2011) and so prevent discolouration of the abalone flesh during storage of the product in cans. However, higher levels of sulphites are required to bleach New Zealand paua due to its very dark colour and then minimise ongoing discolouration during the product's shelf life. Due to their common antioxidant function that occurs in the final food it was considered appropriate to include sodium hydrosulphite along with other permitted sulphites.

2.3 Conclusion

Sodium hydrosulphite is considered to be a food additive because while it bleaches native black New Zealand abalone (paua) to a more consumer acceptable golden blonde to nutmeg colour it continues to prevent subsequent oxidation and discolouration of the product during its shelf life, especially for the international market.

3. HAZARD ASSESSMENT

FSANZ has conducted a hazard assessment of sulphites as part of Proposal P298 - Benzoate and sulphite permissions in food (FSANZ 2005a). The original papers used by the Joint FAO/WHO Expert Committee on Food Additives (WHO 1974) to derive a group Acceptable Daily Intake (ADI) for sulphur dioxide and sulphites, expressed as sulphur dioxide, together with a number of additional papers which have been published since the ADI was established, were reviewed by FSANZ. It was concluded that there was no new suitable evidence available that could change the existing group ADI of 0–0.7 mg/kg bw, expressed as sulphur dioxide.

Sulphite consumption has been linked with allergy-like symptoms and asthmatic reactions in individuals who are sensitive to sulphites (Simon 1998; FSANZ 2005b) and this will also be the case for sodium hydrosulphite.

4. DIETARY EXPOSURE ASSESSMENT

A dietary exposure assessment was not conducted because the proposed use of sodium hydrosulphite will not result in additional dietary exposure to sulphites.

Regarding Proposal P298 (Benzoate & sulphite permissions in food), the sulphite permissions for canned abalone are not under review because consumption of canned abalone is very low compared to the foods that are the largest contributors to dietary exposure to sulphites (sausages, dried apricots and cordial, in the case of children, and white wine, sausages and dried apricots for adults: FSANZ 2005b).

5. RISK CHARACTERISATION

Sodium hydrosulphite undergoes chemical decomposition to produce the same chemical species that result from the use of existing approved sulphites. The use of sodium hydrosulphite in the production of canned abalone will not result in dietary exposure to a new food additive or additional dietary exposure to sulphites. The use of sodium hydrosulphite as a food additive in canned abalone presents no identifiable public health and safety issues above those of the sulphite food additives currently permitted in canned abalone.

6. RISK AND TECHNICAL ASSESSMENT CONCLUSIONS

This risk and technical assessment evaluated the technological suitability and safety of the proposed addition of sodium hydrosulphite to canned abalone.

6.1 Responses to risk and technical assessment questions

1. ***Does sodium hydrosulphite achieve its technological function in the form and quantity used as a food additive for canned abalone?***

<i>Section of report</i>	<i>Summary response/conclusion</i>
Section 2	Evidence submitted in support of this Application provides adequate assurance that sodium hydrosulphite fulfils the stated technological function as a food additive for canned abalone.

2. ***Are there any public health and safety issues associated with the use of sodium hydrosulphite as a food additive for canned abalone?***

<i>Section of report</i>	<i>Summary response/conclusion</i>
Sections 3 and 5	Sulphites are associated with adverse reactions in some individuals, however there are no additional identifiable public health and safety issues associated with the proposed use of sodium hydrosulphite as a food additive for canned abalone.

6.2 Consolidated conclusion

It is concluded that the use of sodium hydrosulphite as a food additive for canned abalone is technologically justified and presents no additional identifiable public health and safety issues above that of the sulphite food additives currently permitted for canned abalone.

7. REFERENCES

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