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April–August 2016

## ELECTRONIC *AD HOC* GROUP ON SAFETY OF PRODUCTS DERIVED FROM AQUATIC ANIMALS<sup>1</sup>

April–August 2016

The *ad hoc* Group on Safety of Products Derived from Aquatic Animals (the *ad hoc* Group) worked remotely as an electronic *ad hoc* group between April and August 2016.

Details of participants and the adopted agenda are presented in Annexes 1 and 2.

The *ad hoc* Group was convened at the recommendation of the OIE Aquatic Animal Health Standards Commission (the Aquatic Animals Commission) to conduct assessments on a range of commodities commonly traded internationally against the criteria provided in Chapter 5.4. *Criteria to assess the safety of aquatic animal commodities* of the OIE *Aquatic Animal Health Code* (the *Aquatic Code*) for acute hepatopancreatic necrosis disease (AHPND).

The *ad hoc* Group conducted assessments for a range of aquatic animal products against the ‘Criteria to assess the safety of aquatic animal commodities for any purpose from a country, zone or compartment not declared free from disease X’ (Article 5.4.1.) and against the ‘Criteria to assess the safety of aquatic animals or aquatic animal products for retail trade for human consumption from a country, zone or compartment not declared free from disease X’ (Article 5.4.2.) for inclusion in the new draft chapter on acute hepatopancreatic necrosis disease (9.X.) for inclusion in the *Aquatic Code*.

The following aquatic animal products were assessed and did meet the criteria in Article 5.4.1.:

- i) heat sterilised hermetically sealed crustacean products (i.e. a heat treatment at 121°C for at least 3.6 minutes or any time/temperature equivalent);
- ii) cooked crustacean products that have been subjected to heat treatment at 100°C for at least 1 min (or to any time/temperature equivalent which has been demonstrated to inactivate VpAHPND);
- iii) crustacean oil;
- iv) crustacean meal;
- v) chemically extracted chitin.

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<sup>1</sup> Note: This *ad hoc* Group report reflects the views of its members and may not necessarily reflect the views of the OIE. This report should be read in conjunction with the September 2016 report of the Aquatic Animal Health Standards Commission because this report provides its considerations and comments. It is available at [www: http://www.oie.int/en/international-standard-setting/specialists-commissions-groups/aquatic-animalcommission-reports/meeting-reports/](http://www.oie.int/en/international-standard-setting/specialists-commissions-groups/aquatic-animalcommission-reports/meeting-reports/)

The following aquatic animal products were assessed and did not meet the criteria in Article 5.4.1.:

- i) pasteurised crustacean products.

The following aquatic animal products were assessed and did meet the criteria in Article 5.4.2.:

- i) frozen peeled shrimp (shell off, head off).

The following aquatic animal products were assessed and did not meet the criteria in Article 5.4.2.:

- i) frozen shrimp (shell on head on).

The individual product assessments are presented in Annex 3.

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.../Annexes

**ELECTRONIC AD HOC GROUP ON SAFETY OF PRODUCTS DERIVED  
FROM AQUATIC ANIMALS**

**April–August 2016**

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**ELECTRONIC AD HOC GROUP ON SAFETY OF PRODUCTS DERIVED  
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**Terms of Reference**

**Background**

The aquatic animal products listed in point 1 of Article X.X.3. and point 1 of Article X.X.11. of the crustacean disease-specific chapters of the *Aquatic Code* have been assessed against the criteria in Chapter 5.4. *Criteria to assess the safety of aquatic animal commodities*.

Acute hepatopancreatic necrosis disease (AHPND) was included as an OIE listed disease (Chapter 1.3.) in the 2015 edition of the *Aquatic Code* and a new draft chapter for AHPND for the *Aquatic Code* is under development. In order to list relevant crustacean products in point 1 of Article X.X.3. and point 1 of Article X.X.11. in the draft AHPND chapter, assessments needed to be conducted against the criteria in Chapter 5.4.

**Purpose**

The electronic ad hoc Group (eAHG) on safety of products derived from aquatic animals were tasked with undertaking assessments for a select list of crustacean products against the criteria in Chapter 5.4. for acute hepatopancreatic necrosis disease (AHPND).

**Agreed Terms of Reference**

1. Consider all available scientific literature to inform the assessment of the selected commodities against the criteria in Chapter 5.4. for AHPND.
2. Assess the following crustacean products against Criteria 5.4.1. *Criteria to assess the safety of aquatic animals and aquatic animal products for any purpose from a country, zone or compartment not declared free from disease AHPND* and determine eligibility for products to be listed in Article 9.X.3.:
  - a) heat sterilised hermetically sealed crustacean products (i.e. a heat treatment at 121°C for at least 3.6 minutes or any time /temperature equivalent);
  - b) cooked crustacean products;
  - c) pasteurised crustacean products;
  - d) frozen crustacean products;
  - e) crustacean oil;
  - f) crustacean meal;
  - g) chemically extracted chitin.

Annex 2 (contd)

3. Assess the following aquatic animal products against Criteria 5.4.2. *Criteria to assess the safety of aquatic animals or aquatic animal products for retail trade for human consumption from a country, zone or compartment not declared free from AHPND* and determine eligibility for products to be listed in Article 9.X.11.:
  - a) frozen peeled shrimp (shell off, head off);
  - b) frozen shrimp (shell on, head on).

**Outputs of the *ad hoc* Group**

1. Draft a report for consideration by the Aquatic Animals Commission at their September 2016 meeting, including a recommendation for listing or not listing specified commodities as safe for trade.
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## **A) Assessments using criteria in Article 5.4.1.**

1. The following aquatic animal products were assessed and did meet the criteria in Article 5.4.1.:
  - i) heat sterilised hermetically sealed crustacean products (i.e. a heat treatment at 121°C for at least 3.6 minutes or any time/temperature equivalent) (see Table I);
  - ii) cooked crustacean products that have been subjected to heat treatment at 100°C for at least 1 min (or to any time/temperature equivalent which has been demonstrated to inactivate VpAHPND) (see Table II);
  - iii) crustacean oil (see Table IV);
  - iv) crustacean meal (see Table V);
  - v) chemically extracted chitin (see Table VI).
  
2. The following aquatic animal products were assessed and did not meet the criteria in Article 5.4.1.:
  - i) pasteurised crustacean products (see Table III).

Table I

## Heat sterilised hermetically sealed crustacean products

Article 5.4.1. criteria	Rationale	Assessment
1. <i>Absence of pathogenic agent in the traded commodity:</i>		
a) <i>There is strong evidence that the pathogenic agent is not present in the tissues from which the commodity is derived.</i>	This commodity largely contains muscle (meat). The AHPND bacteria is present in gut-associated tissues (Tran <i>et al.</i> , 2013; Soto-Rodriguez <i>et al.</i> , 2015); examination of muscle tissue for presence of the bacterium has not been reported in the literature and there is possibility of contamination of muscle by gut-associated tissue.	No
AND		
b) <i>The water (including ice) used to process or transport the commodity is not contaminated with the pathogenic agent and the processing prevents cross contamination of the commodity to be traded.</i>		
OR		
2. <i>Even if the pathogenic agent is present in, or contaminates, the tissues from which the commodity is derived, the treatment or processing to produce the commodity to be traded inactivates the pathogenic agent:</i>		
a) <i>Physical (e.g. temperature, drying, smoking);</i>	Heat treatment is 121°C for 3.6 min or equivalent (e.g. 111°C for 36 min) (Ababouch, 1999, 2002). <i>Vibrio parahaemolyticus</i> is inactivated when heated to 100°C for 1 min (Vanderzant and Nickelson, 1972; Zhang <i>et al.</i> , 2014).	Yes
AND/OR		
b) <i>Chemical (e.g. iodine, pH, salt, smoke);</i>		
AND/OR		
c) <i>Biological (e.g. fermentation).</i>		

## CONCLUSION

VpAHPND is highly likely to be inactivated by this process. Therefore, heat sterilised hermetically sealed crustacean products (i.e. a heat treatment at 121°C for at least 3.6 min or any time/temperature equivalent) are eligible for inclusion in point 1 of Article 9.X.3.



Table II

## Cooked crustacean products

Article 5.4.1. criteria	Rationale	Assessment
1. <i>Absence of pathogenic agent in the traded commodity:</i>		
a) <i>There is strong evidence that the pathogenic agent is not present in the tissues from which the commodity is derived.</i>	This commodity largely contains muscle (meat), but could contain other organs depending on the product. The AHPND bacteria is present in gut-associated tissues (Tran <i>et al.</i> , 2013; Soto-Rodriguez <i>et al.</i> , 2015); examination of muscle tissue for presence of the bacterium has not been reported in the literature.	No
AND		
b) <i>The water (including ice) used to process or transport the commodity is not contaminated with the pathogenic agent and the processing prevents cross contamination of the commodity to be traded.</i>		
OR		
2. <i>Even if the pathogenic agent is present in, or contaminates, the tissues from which the commodity is derived, the treatment or processing to produce the commodity to be traded inactivates the pathogenic agent:</i>		
a) <i>Physical (e.g. temperature, drying, smoking);</i>	<i>Vibrio parahaemolyticus</i> is inactivated when heated to 100°C for 1 min (Vanderzant and Nickelson, 1972; Zhang <i>et al.</i> , 2014).	Yes
AND/OR		
b) <i>Chemical (e.g. iodine, pH, salt, smoke);</i>		
AND/OR		
c) <i>Biological (e.g. fermentation).</i>		

## CONCLUSION

VpAHPND is likely to be inactivated by this process. Therefore, cooked crustacean products that have been subjected to heat treatment at 100°C for at least 1 min (or to any time/temperature equivalent which has been demonstrated to inactivate VpAHPND) are eligible for inclusion in point 1 of Article 9.X.3.

Table III

## Pasteurised crustacean products

Article 5.4.1. criteria	Rationale	Assessment
<p>1. <b>Absence of pathogenic agent in the traded commodity:</b></p> <p>a) <i>There is strong evidence that the pathogenic agent is not present in the tissues from which the commodity is derived.</i></p> <p>AND</p> <p>b) <i>The water (including ice) used to process or transport the commodity is not contaminated with the pathogenic agent and the processing prevents cross contamination of the commodity to be traded.</i></p>	<p>This commodity largely contains muscle (meat). The AHPND bacteria is present in gut-associated tissues (Tran <i>et al.</i>, 2013; Soto-Rodriguez <i>et al.</i>, 2015); examination of muscle tissue for presence of the bacterium has not been reported in the literature and there is possibility of contamination of muscle by gut-associated tissue.</p>	No
OR		
<p>2. <b>Even if the pathogenic agent is present in, or contaminates, the tissues from which the commodity is derived, the treatment or processing to produce the commodity to be traded inactivates the pathogenic agent:</b></p> <p>a) <i>Physical (e.g. temperature, drying, smoking);</i></p>	<p>There are reports of low temperature treatment regimens resulting in inactivation of <i>Vibrio</i> species bacteria, including <i>V. parahaemolyticus</i>. Andrews <i>et al.</i> (2000) indicated a 5D reduction in <i>Vibrio parahaemolyticus</i> in raw oysters subject to 50°C for 5 minutes. Andrews <i>et al.</i> (2003) reported that oysters contaminated with up to 10<sup>6</sup> cfu/g of <i>Vibrio parahaemolyticus</i> were successfully pasteurised by a 52°C treatment for 22 minutes. Zhang <i>et al.</i> (2014) reported complete inactivation of <i>Vibrio parahaemolyticus</i> in alkaline peptone water-salt broth under conditions of 60°C, 5 minutes or 70°C, 2 minutes or ≥80°C, 1 minute, although it is unclear if this was a 4 log<sub>10</sub> reduction or a 6 log<sub>10</sub> reduction. Johnston &amp; Brown (2002) claimed that a 70°C, 2 minute treatment was 100% effective against <i>Vibrio</i> species in artificial seawater. However, none of these studies used shrimp or prawn tissue as the matrix for studying inactivation.</p>	No

a) <i>Physical (e.g. temperature, drying, smoking)</i> (contd);	There is evidence in Johnston & Brown (2002) that the matrix homogenate used has an effect on the D-value obtained. Whilst an older reference, Vanderzant & Nickelson (1972) used shrimp tissue for their experiments and report that treatments of 60°C or 80°C for 15 minutes were not effective in producing a 6 log <sub>10</sub> reduction in <i>Vibrio parahaemolyticus</i> in shrimp tissue and bacteria were recoverable on direct plating and enrichment. Data suggests that neither 63°C, 17 minutes or 72°C, 1 minute has enough evidence to support an assessment of rendering the product safe. Whilst 90°C for 10 minutes is probably effective, there is still enough uncertainty to require further data before considering pasteurised products safe.	No
AND/OR		
b) <i>Chemical (e.g. iodine, pH, salt, smoke);</i>		
AND/OR		
c) <i>Biological (e.g. fermentation).</i>		

#### CONCLUSION

VpAHPND may not be inactivated by this process. Therefore, pasteurised crustacean products that have been subjected to heat treatment at 90°C for at least 10 min (or 72°C for 1 minute, or 63°C for 17 minutes) are not at this time eligible for inclusion in point 1 of Article 9.X.3. Further data is required.

*Note:* Pasteurisation is a food treatment process that is well defined for milk products, but is not well defined for aquatic animal products. There are a number of time/temperature combinations that may be used depending on the product. Officially specified conditions will tend to be determined by the requirement to inactivate bacteria of concern to food safety. As such both the United States of America Food and Drug Administration (FDA, 2001) and Gould (1999) indicate that 90°C for 10 min is required to achieve a 6D reduction in *Clostridium botulinum*. Inactivation standards for *Listeria monocytogenes* are considerably lower. It is proposed therefore that in the first instance a standard of 90°C, 10 min is used. The amount of heat applied during a heat treatment process will determine which of the identified hazards will be eliminated at that point (FOA Fisheries Technical Paper 334, Assurance of Seafood Quality, 1994). *Listeria monocytogenes* is often identified as the target pathogen as it is regarded as the most heat tolerant, food-borne pathogen that does not form spores (U.S. Food and Drug Administration [USFDA] Centre for Food Safety and Applied Nutrition, Fish and Fisheries Products Hazards and Controls Guidance, Third Edition, June 2001). When seafood processors in the US implement HACCP systems to eliminate *L. monocytogenes* contamination, the USFDA guideline recommends minimum internal product temperature/time treatments that include 63°C for 17 minutes and 72°C for 1 minute.

Table IV

## Crustacean oil

Article 5.4.1. criteria	Rationale	Assessment
1. <i>Absence of pathogenic agent in the traded commodity:</i>		
a) <i>There is strong evidence that the pathogenic agent is not present in the tissues from which the commodity is derived.</i>	Raw material for this process is likely to contain most tissues. The AHPND bacteria is present in gut-associated tissues (Tran <i>et al.</i> , 2013; Soto-Rodriguez <i>et al.</i> , 2015).	No
AND		
b) <i>The water (including ice) used to process or transport the commodity is not contaminated with the pathogenic agent and the processing prevents cross contamination of the commodity to be traded.</i>		
OR		
2. <i>Even if the pathogenic agent is present in, or contaminates, the tissues from which the commodity is derived, the treatment or processing to produce the commodity to be traded inactivates the pathogenic agent:</i>		
a) <i>Physical (e.g. temperature, drying, smoking);</i>	Raw material is cooked (may be pre-heated to 50–60°C before cooking at temperatures of 95–100°C for 15–20 minutes. For energy cost reasons and nutritional content, some processors use 80–85°C for 20 minutes). Cooked material is pressed to produce press liquor, and press liquor is heated to 90–95°C, which produces oil. Oil is purified with hot water (at 90°C) (FAO, 1986).  <i>Vibrio parahaemolyticus</i> is inactivated when heated to 100 °C for 1 min (Vanderzant and Nickelson, 1972; Zhang <i>et al.</i> , 2014).	Yes
AND/OR		
b) <i>Chemical (e.g. iodine, pH, salt, smoke);</i>		
AND/OR		
c) <i>Biological (e.g. fermentation).</i>		

## CONCLUSION

VpAHPND is highly likely to be inactivated by this process. Therefore, crustacean oil is eligible for inclusion in point 1 of Article 9.X.3.

Table V

## Crustacean meal

Article 5.4.1. criteria	Rationale	Assessment
<p>1. <i>Absence of pathogenic agent in the traded commodity:</i></p> <p>a) <i>There is strong evidence that the pathogenic agent is not present in the tissues from which the commodity is derived.</i></p> <p>AND</p> <p>b) <i>The water (including ice) used to process or transport the commodity is not contaminated with the pathogenic agent and the processing prevents cross contamination of the commodity to be traded.</i></p>	<p>Raw material for this process is likely to contain most tissues. The AHPND bacteria is present in gut-associated tissues (Tran <i>et al.</i>, 2013; Soto-Rodriguez <i>et al.</i>, 2015).</p>	No
OR		
<p>2. <i>Even if the pathogenic agent is present in, or contaminates, the tissues from which the commodity is derived, the treatment or processing to produce the commodity to be traded inactivates the pathogenic agent:</i></p> <p>a) <i>Physical (e.g. temperature, drying, smoking);</i></p> <p>AND/OR</p> <p>b) <i>Chemical (e.g. iodine, pH, salt, smoke);</i></p> <p>AND/OR</p> <p>c) <i>Biological (e.g. fermentation).</i></p>	<p>The process involves cooking, usually boiling at 100°C for at least 3 minutes, and a drying step at between 115 and 138°C (Velez <i>et al.</i>, 1991).</p> <p>Raw material for this process is likely to contain most tissues. The AHPND bacteria is present in gut-associated tissues (Tran <i>et al.</i>, 2013; Soto-Rodriguez <i>et al.</i>, 2015).</p>	Yes
<b>CONCLUSION</b>		
VpAHPND is likely to be inactivated by this process. Therefore, crustacean meal is eligible for inclusion in point 1 of Article 9.X.3.		

Table VI

## Chemically extracted chitin

Article 5.4.1. criteria	Rationale	Assessment
1. <i>Absence of pathogenic agent in the traded commodity:</i>		
a) <i>There is strong evidence that the pathogenic agent is not present in the tissues from which the commodity is derived.</i>	Exoskeleton is used for this commodity. The AHPND bacteria is present in gut-associated tissues (Tran <i>et al.</i> , 2013; Soto-Rodriguez <i>et al.</i> , 2015). The bacterium is not therefore normally present in exoskeleton and associated cuticular epithelium. However, it is possible that remains of gut tissue may contaminate the exoskeleton.	No
AND		
b) <i>The water (including ice) used to process or transport the commodity is not contaminated with the pathogenic agent and the processing prevents cross contamination of the commodity to be traded.</i>		
OR		
2. <i>Even if the pathogenic agent is present in, or contaminates, the tissues from which the commodity is derived, the treatment or processing to produce the commodity to be traded inactivates the pathogenic agent:</i>		
a) <i>Physical (e.g. temperature, drying, smoking):</i>	The product is heated at 60–70°C for a few hours (Gagné, 1993) in a mild alkaline environment. Given a time temperature combination of 100°C, one minute is effective and Zhang <i>et al.</i> (2014) suggest times in excess of 5 minutes at 60°C results in at least a 4log <sub>10</sub> reduction in <i>Vibrio parahaemolyticus</i> titre and it is highly likely that several hours at 60–70°C will also result in inactivation of the <i>Vibrio parahaemolyticus</i> .	Yes
AND/OR		
b) <i>Chemical (e.g. iodine, pH, salt, smoke):</i>	Hydrochloric acid is used in the processing (Gagné, 1993). Vanderzant & Nickelson (1972) reported pH ≤5, 15 minutes is effective at inactivating <i>Vibrio parahaemolyticus</i> ; therefore use of hydrochloric acid, especially following the previous long heat treatment, would inactivate all <i>Vibrio parahaemolyticus</i> bacteria.	Yes
AND/OR		
c) <i>Biological (e.g. fermentation).</i>		

## CONCLUSION

VpAHPND is likely to be inactivated by this process. Therefore, chemically extracted chitin is eligible for inclusion in point 1 of Article 9.X.3.

**B) Assessments using criteria in Article 5.4.2. (for Article 9.X.11. point 1)**

1. The following aquatic animal products were assessed and did meet the criteria in Article 5.4.2.:
  - i) frozen peeled shrimp (shell off, head off).
2. The following aquatic animal products were assessed and did not meet the criteria in Article 5.4.2.:
  - i) frozen shrimp (shell on head on).

**Table I**

**Frozen peeled shrimp (shell off, head off)**

<i>Article 5.4.2. criteria</i>	<i>Rationale</i>	<i>Assessment</i>
1. <i>The aquatic animal product is prepared and packaged for retail trade for human consumption.</i>	It is part of the commodity definition.	Yes
<i>AND/EITHER</i>		
2. <i>It includes only a small amount of raw waste tissues generated by the consumer.</i>	There are no waste tissues because the entire product is consumed.	Yes
<i>OR</i>		
3. <i>The pathogenic agent is not normally found in the waste tissues generated by the consumer.</i>		
<b>CONCLUSION</b>		
Frozen peeled shrimp (shell off, head off) that are prepared and packaged for retail trade for human consumption normally does not produce waste. Therefore, frozen shrimp (shell off, head off) is eligible for inclusion in Article 9.X.11.		



Table II

## Frozen shrimp (shell on, head on)

<i>Article 5.4.2. criteria</i>	<i>Rationale</i>	<i>Assessment</i>
1. <i>The aquatic animal product is prepared and packaged for retail trade for human consumption.</i>	It is part of the commodity definition.	Yes
<i>AND/EITHER</i>		
2. <i>It includes only a small amount of raw waste tissues generated by the consumer.</i>	Waste includes shell, cephalothorax, legs.	No
<i>OR</i>		
3. <i>The pathogenic agent is not normally found in the waste tissues generated by the consumer.</i>	The AHPND bacteria is present in gut-associated tissues (Tran <i>et al.</i> , 2013; Soto-Rodriguez <i>et al.</i> , 2015) which are part of the cephalothorax. While freezing appears to be effective at reducing bacterial numbers ( <i>Vibrio parahaemolyticus</i> ), 100% inactivation cannot be assured even after 10 weeks at low temperatures (Liu <i>et al.</i> , 2009; Muntada-Garriga <i>et al.</i> , 1995; Vasudevan <i>et al.</i> , 2002).	No

**CONCLUSION**

Frozen shrimp (shell on, head on) that are prepared and packaged for retail trade for human consumption may produce amounts of waste that cannot be considered small; the pathogenic agent may be found in the waste. Therefore, frozen shrimp (shell on, head on) is not eligible for inclusion in Article 9.X.11.

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