

THE IMPORTANCE OF BORDER INSPECTION IN CONTROL HISTAMINE POISONING FROM CANNED TUNA

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ZNAČAJ GRANIČNE INSPEKCIJE U KONTROLI TROVANJA HISTAMINOM IZ KONZERVI OD TUNA

Apstrakt

Republika Srbija nema sopstvenu proizvodnju morskih riba i poseduje svega nekoliko objekata za preradu morske ribe. Sva morska riba se uvozi, samim tim su i sve konzerve od komada i komadića tunja na našem tržištu uvezene. Uvoz konzervi od tunja, kao i svih drugih ribljih proizvoda prilikom ulaska u našu zemlju se mora podvrgnuti kontroli granične veterinarske inspekcije. Odmah nakon prispeća pošiljke na granični prelaz lice odgovorno za pošiljku, pored obrasca zajedničkog veterinarskog ulaznog dokumenta za proizvode, podnosi i zahtev za veterinarsko sanitarni pregled. Svaka pošiljka konzervi od tunja u uvozu u Republiku Srbiju mora biti podvrgnuta pregledu dokumentacije, identifikaciji pošiljke i fizičkom, hemijskom, mikrobiološkom i senzorskom pregledu.

Sadržaj histamina u ribama i proizvodima od riba je pre svega kriterijum bezbednosti hrane obzirom da utiče na zdravlje ljudi, ali je u isto vreme i pokazatelj higijene procesa i svežine proizvoda. Cilj ove studije je da se obezbede informacije o prisustvu histamina u uvezenim konzervama od tunja i da se ukaže na značaj granične inspekcije u kontroli histaminske intoksikacije koja nastaje kao posledica konzumiranja konzervi od tunja sa povišenim sadržajem histamina.

Tokom jednogodišnje studije (od januara do decembra 2014. godine) ispitano je 97 proizvodnih partija uvezenih konzervi od tunja. Svih 97 proizvodnih partija je uzorkovano tokom granične inspekcije i ispitano u laboratorijama Naučnog instituta za veterinarstvo „Novi Sad“. Ispitivanje sadržaja prisustva histamina u konzervama od tunja je urađeno ELISA metodom sa test kitom HIS-E02 (Immunolab GmbH, Germany).

Rezultati studije pokazuju da je 3,09 % proizvodnih partija uvezenih konzervi od tunja imalo nezadovoljavajuće povećan nivo sadržaja histamina i da nisu bezbedne za ljudsku ishranu. Sve proizvodne partije kod kojih je dokazan povećan nivo histamina, odnosno koje su proglašene za nebezbedne za ljudsku ishranu su vraćene, a uvoz je zabranjen. Granična

inspekcija, tj. ispitivanje pri graničnoj inspekcije predstavlja značajnu preventivnu meru u sprečavanju histaminske intoksikacije kao posledice konzumiranja konzervi od tunja sa povišenim sadržajem histamina.

Ključne reči: granična inspekcija, histamin, konzervirana tunjevina

Key words: Border Inspection, histamine, canned tuna

INTRODUCTION

Fish and fishery products are widely consumed in many parts of the world because they have high protein content, low saturated fat and also contain omega fatty acids known to support good health (Swanson et al., 2012).

Tuna is one of Scombroid toxin-forming species in which significant levels of histamine may be produced by decarboxylation of free histidin (Hungerford, 2010). Histamine production in fish is related to the histidine content of the fish, the presence of bacterial histidine decarboxylase and environmental conditions.

Histamine content in fish and fish products is a criterion for food safety due to its effects on human health, but is also an important indicator of hygiene level of the food production process and product freshness. Histamine poisoning is a food-borne chemical intoxication occurring within few minutes to several hours following the ingestion of foods that contain unusually high levels of histamine and possibly other biogenic amines (Taylor, 1986; WHO, 2012; Er et al., 2014). The symptoms of histamine poisoning resemble an allergic reaction and there is potential for misdiagnosis, since symptoms are usually mild, it is likely that the illness is considerably under-reported. All canned tuna in our country is imported. Imports of canned tuna from all other countries must enter the Republic of Serbia via an approved Border Inspection under the authority of an official veterinarian. Import controls are in place to protect human health. Each consignment is subject to a systematic documentary check, identity checks, physical, chemical, microbiological and sensory check.

Some studies revealed that histamine formation could occur during storage of fish products (Veciana-Nogues et al., 1996). Implementation of HACCP concept and prerequisite programs (PRPs) into the fish processing industry is essential to reduce risk of histamine occurrence. The level of histamine in fish products cannot be reduced by cooking, or preservation and freezing since the compound is heat stable (Visciano et al., 2014).

Histamine is generally not uniformly distributed in a fish or in a lot. Because of that, the validity of histamine testing is dependent upon the design of the sampling plan (FDA, 2011). The legislative acts of the Republic of Serbia (Official Gazette RS 72/2010) are harmonized with the Directive of European Union (Commission Regulation 2073/05). The examination of one production lot includes testing of 9 units. The permitted level implies that not more than two out of nine sample units may contain between 100 and 200 mg/kg; however, none of the units may exceed the upper histamine limit of 200 mg/kg.

MATERIAL AND METHODS

During a two-year study (January, 2013 – January, 2015) 97 imported canned tuna production lots were examined in 9 units. All samples which were collected during Border

Inspection were examined in laboratories of Scientific Veterinary Institute „Novi Sad“. The presence of histamine in canned tuna was analyzed by enzyme-linked immunosorbent assay method (ELISA), using test kit HIS-E02 (Immunolab GmbH, Germany). Histamine concentrations were determined according to the manufacturer's procedure. Subsamples of 10 g were extracted with 0.1 M hydrochloric acid. After dilution and derivatization, samples or standards containing derivatized histamine and an antibody directed against histamine were placed into the wells of the microtiter plate. A histamine conjugate is bound on the surface of a microtiter plate. Immobilized and free histamine compete for the antibody binding sites. After incubation, washing and removing of unbound material, a peroxidase conjugate directed against the histamine antibody was added into the wells. After the second incubation, the plate was washed again and substrate solution was added and then incubated, which resulted in the development of blue colour. By addition of a stop solution, colour turned yellow. The intensity of yellow colour was measured photometrically at 450 nm (Multiskan FC, Thermo Scientific, China) and it is inversely proportional to the histamine concentration in the sample. Special software, the Rida®Soft Win (Art. No. Z9999, R-Biopharm, Germany) was used for the evaluation of enzyme immunoassay. Laboratory detection limits for histamine determination in canned tuna were 10 mg/kg, recovery of the method was 94.3%. The analytical quality of the ELISA method was assured by the use of reference material (lyophilized tuna muscle, T1134A-1/CM, Progetto, Trieste, Italy), as well as by participation in proficiency testing scheme (canned fish sample, FAPAS 27110).

RESULTS

The results of histamine content in unfit production lots are displayed in Table 1. Out of 97 analyzed production lots, 94 (96.9%) were under the regulatory limit according to the legislative acts of the Republic of Serbia (Official Gazette RS 72/2010).

Table 1. Histamine contents in unfit production lots

No.	Country of origin	Histamine content mg/kg								
		1 st unit	2 nd unit	3 rd unit	4 th unit	5 th unit	6 th unit	7 th unit	8 th unit	9 th unit
1.	Vietnam	124.5	41.38	160.30	10	28.51	52.91	33.61	72.03	162.91
2.	Thailand	75.46	135.21	268.65	274.67	437.32	183.08	158.59	207.37	152.58
3.	Thailand	196.01	35.26	121.04	70.84	40.96	74.85	233.86	178.27	146.95

Our results confirmed that concentration of histamine can vary considerably from unit to unit. which required that examination of one production lot has to include testing of 9 units.

DISCUSSION AND CONCLUSION

The Food and Drug Administration (FDA) established HACCP programme for seafood industry and defined critical control points for analyses of marine fishery products. According to FDA (2010), canned tuna products with histamine level < 10 mg/kg is considered to be of good quality, the level 30 mg/kg indicates significant deterioration, whereas level of 50 mg/kg represents conclusive evidence of deterioration.

Histamine poisoning is one of the most important public health and safety concern and a trade issue. In the United States histamine poisoning is the most prevalent form of sea-food-borne disease (Lehane and Olley, 2000). UK, USA and Japan are countries with the highest number of reported incidents. Less frequent incidents have been reported elsewhere in world (Lehane and Olley, 2000). Histamine in fish and fish products was the responsible agent for 17 outbreaks in 2008 in Europe (EFSA, 2011). In 2008, the French Institute for Public Health Surveillance reported an increase in the number of histamine food poisoning outbreaks and cases in France and also during a border control 872.86 ppm levels of histamine in frozen tuna originating from Vietnam was discovered (Guillier et al. 2011). In 2008, in Sweden the findings of exceeding histamine in canned tuna coming from the Philippines were notified. The alert was based on food poisoning (EU, 2008). Between 2005 and 2010 the recorded histamine notifications were 246 of which even 119 notifications were recorded thanks to Border Inspection (EFSA, 2011).

Food safety relevant factors such as global canned fish trade and consumers' eating habits are changing. Therefore there is a need to periodically revisit the histamine related food safety issues and consider any new related knowledge, and data and trends which may enable further improvements of histamine poisoning risk reduction strategies.

Our analysis revealed 3.09% production lots of canned tuna with significant level of deterioration. All production lots of canned tuna with high content of histamine that were declared unfit for human consumption have been returned and the import was banned. That is the possibility that histamine poisoning was prevented.

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