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OCCURRENCE OF OCHRATOXIN A - PRODUCING MOULDS AND OCHRATOXIN A IN SOME MEAT PRODUCTS

Marija Škrinjar[1], Mihail Danev[2], Božin Petrevski[3], Vanda Došen - Bogićević[1] and Gordana Dimić[1]

[1]University of Novi Sad, Faculty of Technology, 21000 Novi Sad, Yugoslavia, [2] University "Kiril i Metodije" , Veterinary Institute, 91000 Skopje, Republic of Macedonia and [3]Ministry of Health, 91000 Skopje, Republic of Macedonia

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Background:

Ochratoxin A (OA), a toxic metabolite of several *Aspergillus* and *Penicillium* species, is very often contaminant of various types of foods and raw materials for their production in Balkanian countries. It is a nephrotoxic and hepatotoxic compound and many mycotoxicologists consider that OA is associated with Balkan endemic nephropathy (Krogh et al., 1977; Petkova-Bočarova & Castegnaro, 1985).

Objectives:

The objective of this study was to examine the occurrence of ochratoxin A - producing moulds on some meat product surfaces, their share in isolated mycopopulations and the presence of OA.

Material and Methods:

Samples. The presence of ochratoxigenic moulds and OA in various meat products (80 samples: tea sausage-11, Budim's sausage-6, Novi Sad's sausage-7, summer sausage-5, barbecue sausage-11, Serbian sausage-8, beef sausage-4, pork sausage-7, mortadella-2, bacon fat-7, smoked ham-7, dried neck-5) was investigated. Samples were taken from meat processing plant and from market.

Mycological investigation. Total viable counts of moulds per cm^2 was performed by cutting out a visible moulded piece of surface of meat product and transferring into Petri dishes. After that 15 ml of Sabouraud dextrose agar (SDA) with 1 % of streptomycin was added. Incubation was done at 25°C for 7 days. Isolation and identification of *Aspergillus* and *Penicillium* species were carried out according to Samson & van Reenen-Hoekstra (1988) and Samson et al. (1976).

Mycotoxicological investigation. Qualitative and quantitative determination of OA was performed by using a TLC method given by O.A.O.C. Methods (1990).

Results and Discussion:

Mycological investigation. Between 6.6 and 27.8 moulds per cm^2 were isolated from visible moulded surface of meat products. About 3 % of meat samples were contaminated with *Aspergillus* spp. Only one of them (*A. ochraceus* Wilhelm) belongs to the producers of OA (Samson & van Reenen-Hoekstra, 1988). It was isolated from smoked ham only (Table 1).

Table 1. Ochratoxigenic mould species isolated from meat products

Meat product	Mould species					
	A. ochraceus	*P.aurantiogriseum*	*P. chrysogenum*	*P. commune*	*P. verrucosum* var. *verrucosum*	*P. verrucosum* var. *ochraceum*
Tea sausage		+	+			
Budim's sausage		+	+			
Novi Sad's sausage		+	+			+
Summer sausage		+			+	
Barbecue sausage		+	+			
Serbian sausage		+	+	+		+
Beef sausage		+	+			
Pork sausage		+	+	+		
Mortadella		+	+			
Bacon fat		+		+		
Smoked ham	+		+			
Dried neck		+			+	

A dominant share in mycopopulations isolated from meat products had *Penicillium* species. They found to be contaminants of all samples tested. Five species, from totally 16 *Penicillium* species (*P. aurantiogriseum* Dierckx, *P. chrysogenum* Thom, *P. commune* Thom, *P. verrucosum* Dierckx var. *verrucosum*, *P. verrucosum* Dierckx var. *ochraceum* (Thom) Samson, Stolk & Hadlok), are known as OA - producing moulds.

P. aurantiogriseum was the most frequent fungus. All meat products, except smoked ham, was contaminated with it. Incidence of high contamination caused by *P. chrysogenum* was also observed on all products, except summer sausage, bacon fat and dried neck.

P. commune was isolated from Serbian sausage, pork sausage and bacon fat, *P. verrucosum* var. *verrucosum* from summer sausage and dried neck and *P. verrucosum* var. *ochraceum* from Novi Sad's sausage and Serbian sausage.

It was found that *P. chrysogenum* had the highest share in mycopopulations. Even 93 % of fungal strains isolated from tea sausage, 65 % of strains isolated from Budim's sausage as well 63 % of them originated from pork sausage belonged to this mould species. Further, between 36 and 48 % of strains isolated from barbecue sausage and beef sausage were determined as *P. chrysogenum*.

Mycotoxicological investigation showed that OA was found in tea sausage (2 samples), pork sausage (1 sample), barbecue sausage (1 sample) and beef sausage (1 sample) (Table 2). Concentrations of OA varied from hardly detectable (trace) to 12.0 μg/kg. The presence of OA probably resulted by fungal growth on the surface of meat products. Namely, OA - producing moulds were isolated from toxin-positive meat samples, too.

Table 2. Meat products contaminated with OA

Meat product	No. of samples tested	OA - positive samples	Concentration of OA ($\mu g \cdot kg^{-1}$)
Tea sausage	11	2	12.0
Budim's sausage	6	-[a]	-
Novi Sad's sausage	7	-	-
Summer sausage	5	-	-
Barbecue sausage	11	1	trace
Serbian sausage	8	-	-
Beef sausage	4	1	trace
Pork sausage	7	1	trace
Mortadella	2	-	-
Bacon fat	7	-	-
Smoked ham	7	-	-
Dried neck	5	-	-

[a] OA was not detected

Conclusions:

- 80 samples of various meat products (tea sausage, Budim's sausage, Novi Sad's sausage, barbecue sausage, Serbian sausage, beef sausage, pork sausage, mortadella, bacon fat, smoked ham, dried neck) were analyzed on the presence of ochratoxigenic moulds and ochratoxin A (OA).
- From 6.6 to 27.8 moulds per cm^2 of visible moulded meat products surfaces were established.
- Ochratoxigenic moulds were isolated from all of meat product tested. They were classified into 6 species: *A. ochraceus, P. aurantiogriseum, P. chrysogenum, P. commune, P. verrucosum* var. *verrucosum* and *P. verrucosum* var. *ochraceum.*
- All types of meat products, except smoked ham, were contaminated with *P. aurantiogriseum* and only one type (smoked ham) with *A. ochraceus.*
- The highest share in isolated mycopopulations had *P. chrysogenum.*
- Five samples (tea sausage - 2, barbecue sausage - 1, beef sausage - 1, pork sausage - 1) contained OA at concentrations from hardly detectable (trace) to 12.0 μg/kg.

Pertinent literature:

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