

# TOXICOLOGICAL ASPECTS IN RAW-DRY PRODUCTS

MONICA ROMAN\*<sup>1</sup>, MONICA POTROVITA\*, MIHAELA BADEA\*\*

\**Sanitary- veterinary and Food Safety Direction of Brasov, 20 A Feldioarei St., Brasov, Romania*, \*\**Transilvania University of Brasov, Romania*

**Abstract:** The present study focuses on the analytical results of the different types of raw-dry salami distributed in the commercial market area of the city of Brasov. The food additives' accurate measurement is essential for the necessity of respecting the law as well as for the consumers' adequate informing regarding what they consume, taking into account the possible toxic effect of some additives (nitrites, antioxidants).

From an analytical point of view, the analysed products' stability and safety have been observed by determining the heavy metals such as Cd and Pb. The obtained results were reported to be tantamount to the product standards and the laws regarding the levels of contamination and food additives ( Order. 438/2002 of Family and Safety Ministry and Agriculture, Foods and Woods Ministry ; Order. 97/ 2005 ANSVS.)

**Keywords:** Raw-dry sausages and salami, residual nitrite, the heavy metals.

## INTRODUCTION

The well-informed consumers prefer fresh meat products. Raw-dry sausages and salami fall into this category because they are well-preserved for longer periods of time and for their specific flavor. Our study's objective was to evaluate and to appreciate the chemical risks the consumers may be exposed to by consuming these types of meat products.

The nitrites and nitrates are used in the meat product compositions for the stimulation of their pink-reddish colour effect in doses from 3 to 50 mg NO<sub>2</sub><sup>-</sup> / kg (Cassens, 1995); for the typical aroma in doses from 20 to 40 mg NO<sub>2</sub><sup>-</sup> / kg (Banu, 2000); for the inhibiting of the fat oxidation (Banu et al, 1997)) and for the controlling of the altering microorganisms' development (*Pseudomonas* and *Enterobacter*) and pathogenic bacteria (*Staphylococcus aureus*, *Listeria monocytogenes*, *Clostridium Botulinum*, *Salmonella*) in doses from 80 to 150 mg NO<sub>2</sub><sup>-</sup> / kg (McKnight et al., 1999) (Dan, 2000).

Nitrites prevent the germination of *Clostridium Botulinum* spores and inhibits the production of deadly botulinic toxin in doses from 10 to 160 mg

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<sup>1</sup> Corresponding author: Monica Roman, *Sanitary- veterinary and Food Safety Direction of Brasov, 20 A Feldioarei St., Brasov, Romania*, Tel : 440257, Fax : 40 268 /441722, E-mail : [romanmona60@yahoo.com](mailto:romanmona60@yahoo.com)

NO<sub>2</sub><sup>-</sup>/ kg (Banu, 2000) . The reduced water activity, the low pH level, the high salt concentration are all factors that guarantee these products' preservation.

For safety reasons against the nitrites' toxicological effects, also known as "restrictive ingredients", small carefully- controlled doses are used in meat products. One of the main concerns is the induction of methemoglobin which at a high-rate nitrite quantity (direct toxicity) decreases the oxygen delivery to the tissues, resulting in cyanosis (at >20% methemoglobin) and eventually in anoxia (at >50% methemoglobin) (Coman et al., 1999). Another aspect is determined by the formation of N-nitroso compounds (indirect toxicity) in special circumstances, compounds whose carcinogenic effect was tested on animal models (Enache et al., 1997).

For safety reasons the European Council regulated the Acceptable Daily Intake (ADI) at 0...0.07 mg NO<sub>2</sub><sup>-</sup> /kg of body weight. The intake was accepted after a study performed on laboratory rats for which a quantity of 5.4 mg NO<sub>2</sub><sup>-</sup> /kg of body weight per day was used- with a safety factor of 100 and no observed adverse effect level (Mensinga et al., 2003).

At present, the heavy metal pollution is a serious issue that concerns countries worldwide. In case of animals the heavy metals are accumulated especially in the liver and kidneys. Pb and Cd may induce deviations in the human metabolism and acute intoxication when ingested in bigger doses. This is why the maximum admitted levels are implemented by means of law, these being 0.1 mg/kg for Pb and 0.05 mg/kg for Cd according to Ord. 97/2005 ANSVS.

## MATERIALS AND METHODS

The raw-dry salami and sausages were purchased from specialized food supermarkets namely: *Luca*, *Lefrumarin*, *Sergiana* , *Carrefour* and *Profi*. They had been produced by different suppliers ( Spak, Aldis, Luca, Salonta, Campofrio, Lefrumarin, Sergiana)

The raw-dry salami and sausages were cut into quarters, minced and homogenized with a mixer and after being transferred into hermetic recipients, they were deposited at 4<sup>0</sup> C until the carrying out of the analyses.

The analytical control was reflected by:

**Residual nitrites:** the sodium nitrite was directly determined by the extracted samples in a warm environment and deproteinised by means of the Griess method (according to STASS 9065/9-74).

**Heavy metals:** the heavy metals (Pb, Cd) were determined after the calcination of raw-dry sausages by means of atom absorption (according to SR-EN 14 082/2-2003.)

All the chemical substances used were certified with quality certificates by the supplying firms. The labels used were Merck and the equipment that was necessary for the determinations checked and labelled metrologically.

## RESULTS AND DISCUSSIONS

20 samples of raw-dry salami and sausages, in the guarantee period, specified by the producers were analysed. The results are presented in Table 1.

Table 1. The variation of nitrites in raw-dry salami and sausages

Range	Residual Nitrites	
	mg%	mg/100s.u.
Home salami	0.001	0.0015
Dacian salami	0.053	0.0826
Home salami	0.002	0.0031
Salonta salami	0.22	0.3056
Picante salami	0.098	0.13304
Săliște salami	0.656	0.8980
Palociega salami	0.358	0.4696
crud uscat salami	0.067	0.1000
Luca salami	0.197	0.2775
Tâmpa salami	0.203	0.2748
Braşov salami	0.452	0.6794
Bănăţean salami	0.276	0.4410
Baciu salami	0.328	0.5281
Săcelean salami	0.276	0.4427
Chorizo salami	0.22	0.3073
Poiana Mărului salami	0.76	1.0806
Bardaş salami	0.198	0.2810
Plaiul Foi sausages	0.214	0.2991
Piatra Craiului sausages	0.342	0.4787
Bănăţean salami	0.255	0.3794

s.u.= dry substance

As can be seen in Table 1., the residual nitrite levels were extremely reduced for all food ranges, varying from (0.001-0.76) mg/100g product (0.0015-1.081mg/100 g dry substance.). The nitrite's degradation into raw salami

compositions is a dynamic process favored by the addition of starter cultures and glucono- $\delta$ -lactona by a pH value reduction and possibly by the addition of substances with reduction character (sodium ascorbat).

The low residual nitrite values in raw-dry salami and sausages are not a chemical risk for the consumers.

Of the utmost importance from a toxicological point of view, besides the strict and permanent monitoring of nitrite levels in meat products, is the controlling of the heavy metals' presence. The heavy metals resulting from the raw materials used, spices, water and due to technological deficiencies directly linked to the material quality, mostly in the zone with direct contact with the salty meat.

In Romania, the maximum admitted Pb and Cd levels for raw-dry meat products are established by law. All the analysed samples were free of Cd whereas for Pb the levels vary from 0.000mg/Kg to 0.0798 mg/Kg as is presented in Table 2. Thus, from this viewpoint, they are not a risk for the consumer (Roman, 2006).

Table 2 : The heavy metals in the analysed raw-dry salami and sausages

No.	Analysed range	Heavy Metals	
		Pb, mg/ Kg	Cd, mg/ Kg
1	Home salami	0.0702	abs.
2	Dacian salami	0.0855	abs.
3	Home salami	0.0431	abs.
4	Salonta salami	0.0239	abs.
5	Picante salami	0.0748	abs.
6	Săliște salami	0.0442	abs.
7	Palociega salami	0.0593	abs.
8	crud uscat salami	0.0485	abs.
9	Luca salami	0.0322	abs.
10	Tâmpa salami	abs.	abs.
11	Braşov salami	0.0233	abs.
12	Bănăţean salami	abs.	abs.
13	Baciu salami	0.0798	abs.
14	Săcelean salami	abs.	abs.
15	Chorizo salami	0.0234	abs.
16	Poiana Mărului salami	0.0376	abs.
17	Bardaş salami	0.0427	abs.
18	Plaiul Foi sausages	0.0538	abs.

19	Piatra Craiului sausages	0.0264	abs.
20	Bănăţean salami	0.0644	abs.

## CONCLUSIONS

- All types of the analysed raw salami had very low residual nitrite levels, stimulated by the GdL addition or lactic bacteria starter culture, which favored the pH value reduction of salami compositions under 0.5 and the nitrite's conversion into nitrogen oxide.
- The analysed products did not contain Cd, and regarding the Pb levels, they are not a major chemical risk to human health.
- The analytical control of meat products is an important element for quality and safety guarantee for the consumer.

## REFERENCES

1. Cassens, R.G., *Use of sodium nitrite in cured meat today*. Food Technology, 1995, July, 72- 80.
2. Banu C., *The additives and ingredients for Food Industry*, Ed.Tehnica, Bucuresti, 2000, 549-559.
3. Banu, C., Vizireanu C., Alexe P., *The industrial processing of meat*, Ed. Tehnica, Bucuresti, , 1997, 208-213, 455.
4. McKnight G..M., W. Duncan C., Leifert C., Golden M.H., Dietary nitrate in man: friend or foe?, 1999, Br. J. Nutr.( 81), 349-358 .
5. Dan V., *The microbiology of food products*, Ed. Alma, Galati , 2000, (2), 113.
6. Coman G., Badea M., Draghici C., *Elemente de biochimie medicala*, Editura Lux Libris, Brasov, 1999, 61-147.
7. Enache T. , Paul I., Stanescu V., Popescu O., Iordache I., *Medicină legală veterinară*,Editura All, Bucureşti, 1994,,774-778,
8. Mensinga T.T., Speijers G.J., Meulenbelt J., *Health implications of exposure to environmental nitrogenous compounds*, 2003, Toxicol Rev., 22, 41-51.
9. Roman M., *The establish of the technological process in control and reducing of nitrites level in food products* (Ph.D. paper), 2006, Galati, Romania