RESIDUAL NITRITE LEVELS IN DIFFERENT TYPES OF SAUSAGES

S. Saicic*, D. Vranic and D. Trbovic

Institute of Meat Hygiene and Technology, 11000 Belgrade, Serbia and Montenegro.
Email: meatinst@beotel.yu

Keywords: nitrite, sausages, permitted level

Introduction

Nitrite is widely used as additive in cured meat products for the reason of several beneficial effects such as redding (stabilizing the colour component of the products and obtaining characteristic flavour of cured meat), as preservative and as antioxidant. Nitrite in meat greatly delays development of botulinum toxin (botulism) and destroys the other pathogenic microorganisms (Christiansen *et al.*, 1975). In spite of their positive influence on ripening, colour and stability of meat products, nitrite also has mutagenic and toxic properties that are leading to formation of carcinogenic N-nitrosoamines and N-nitrosoamides (Sugimura *et al.*, 1986; Hotchkiss *et al.*, 1992). The known acute and chronic toxic effect of nitrite is the production of methaemoglobin (MetHg) by reacting with haemoglobin, which does not possess the ability to carry oxygen. This intoxication is named methaemoglobinemia (Kennedy *et al.*, 1997). Therefore, usage of nitrites that are quite effective on human health, have to be done with utmost care and kept under control. Hence, this study was undertaken to determine residual nitrite levels in different kinds of sausages.
The main objective of this investigation was to determine nitrite levels in fermented dry sausages, boiled and cooked sausages according to the Regulations of Food Additives quality . (Off. Journal of SCG, No 56/2003).

Materials and Methods

The 78 fermented dry sausages, 89 minced boiled sausages, 83 grounded boiled sausages, 33 boiled sausages with meat pieces and 86 cooked sausages were used for determination of nitrite content. All samples of sausages originated from Serbian producers. For the determination of nitrite content, the standard method was used (JUS ISO 2918/1999). The principle of the method is reaction between dinitronium salt and aromatic amine (N-(1-Naphthyl)ethylenediamine dihydrochloride) to give a red coloured aminonitro compound, whose absorbance is measured spectrophotometrically at 538 nm.

Results and Discussion

Nitrite content (minimum, maximum and mean value), maximum permitted values and number of samples which ara not in compliance with the Regulations are presented in Table1.

Table 1: Nitrite content in different types of sausages, mg/kg.

Type of sausages	Number of samples	Nitrite content, mg/kg min	max	Mean value mg/kg	Maximum permmitted values	N*	N*,%
Fermented dry sausages	78	0.00	59.19	4.15	50.00	1	1.28
Minced boiled sausages	89	0.00	102.36	38.33	100.00	1	1.12
Grounded boiled sausages	83	0.76	93.94	39.30	100.00	0	0
Boiled sausages with meat pieces	33	2.39	74.84	45.66	100.00	0	0
Cooked sausages	86	0.00	100.00	16.99	100.00	0	0

N* - Number of samples which is not in compliance with the Regulations

The average nitrite concentrations in fermented dry sausages were lower than the concentrations found in other types of sausages, 4.15 mg/kg (0.00-59.19 mg/kg), because of the fact that residual nitrite contents may be reduced due to storage time and also microorganism activities, when starter cultures are used. In Serbia and Montenegro, residual quantities of nitrite in the final products are limited by the Regulations of Food Additives quality (Official Journal of SCG, No 56/2003). Maximum permitted level in fermented dry sausages is 50 mg/kg and in the other types of products

is 100 mg/kg. The nitrite level from only one sample (1.28%) of the investigated fermented dry sausages was higher than the level permitted by the Regulations.
The average nitrite levels in group of boiled sausages were: 38.33 mg/kg (0.00-102.36 mg/kg) in minced boiled sausages, 39.30 mg/kg (0.76-93.94 mg/kg) in ground boiled sausages and 45.66 mg/kg (2.39-74.84 mg/kg) in boiled sausages with meat pieces. Only one sample (1.12%) of minced boiled sausages was not in compliance with the Regulations.
The average nitrite content in cooked boiled sausages was between fermented dry sausage and boiled sausage levels, 16.99 mg/kg (0.00-100.00 mg/kg).

Conclusions

On the basis of the research results which were done on different kinds of sausages, the following conclusions should be emphasised:
- In total, 369 sausages were investigated, only two samples (0.54%) were not in compliance with the Regulations of Food Additives quality (Official Journal of SCG, No 56/2003).
- These results also showed that in the meat industry, curing salt mixture are used according to the Official Journal rules.

References

Christiansen, L.N., Tompkin, R.B., Shaparis, A.B., Johnston, R.W. and Kautter, D.A. (1975). Effect of sodium nitrite and nitrate on Clostridium botulinum growth and production in summer style sausage. Journal of Food Science, 488-490.

Hotchkiss, J.H., Helser, M.A., Maragos, C.M and Weng, Y.M. (1992) Nitrate, nitrite and N-nitroso compounds in Food Safety Assesment (Eds J.W.Finley, S. Kobinson and D.J. Armstrong). American Chemical Society, Washington DC, 400-418.

Kennedy, N., Smith, C.P., Mc Whinney, P. (1997) Faulty sausage production causing methaemoglobinaemia. Archives of Disease in Childhood, 76: 367-368.

Sugimura, T., Sato, S., Ohgaki, H., Takayama, S. Nago, M. and Wakabayashi, K. (1986) Mutagens and carcinogens in cooked food. Genetic Toxicology of the Diet (Ed. J. Knudsen), Alan R. Liss, New York, 85-107.