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# CONTRIBUTION OF MEAT PRODUCTS TO STATISTICAL CONSUMER'S DAILY INTAKE OF NITRITES IN POLAND

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Please refer to Folio 37.

## INTRODUCTION

The concern for consumer's health imposes close monitoring of food contaminations. In chemical contaminants, the degree of hazards depends on two factors: their concentration in products and food intake.

In Poland, the first joint balance of those factors was done by Committee of Food Technology and Chemistry, Polish Academy of Sciences, published in 1984 (edition 1) and 1986 (edition 2) (Barylko-Pikielna, *et al.*, 1984; 1986), at this time for intake of residual chloroorganic pesticides and metals: lead, mercury and cadmium. In the next extended experts' report titled: "Chemical Food Contaminations; State and Sources" (Barylko-Pikielna, Tyszkiewicz 1991), a daily intake of nitrites and nitrates was also balanced. On the base of concentration of nitrites and nitrates in foods measured in 1982-1989 and specially in 1986-1988 and statistical data of food intake in 1987 and 1988 from Central Statistical Department, it was estimated that intake:

mean: a sum of products of food intake and mean concentration of nitrites and nitrates
extreme: a sum of products of food intake and upper ninetieth percentile of distribution of nitrites and nitrates concentrations.

Balances were done for highly integrated groups of food. For 25 positions of the statistical list there were only 14 positions associated with significantly elevated nitrite and nitrate contributions to intake: potatoes, fresh vegetables, processed vegetables, fresh fruits, processed fruits, fresh meat (with poultry), cured meat, fish, milk, powdered milk, cottage cheese and hard cheese, sour-cream and drinkable water. On the basis of these assessments, there were established a list of foods giving the largest contribution to nitrite and nitrate intake, as follows in Table 1.

The assessments showed cured meat as a main source of nitrites intake and as third-row source of nitrates intake. Because of the social importance of that, on the base of newest statistical data about food intake and our representative measurements of nitrite and nitrate concentrations in meat and its products from all over the country, the assessments were done again.

## MATERIALS AND METHODS

In 1992 the concentrations of nitrites and nitrates were measured in 484 samples of meat products (without canned meat) including 394 samples of undurable and half-durable sausages, 12 samples of durable sausages, 55 samples of lean high-quality smoked meats (ham, loin, butt) and 23 samples of fatty smoked meats (belly, bacon). They also examined 24 samples of canned ham (lean).

Nitrites and nitrates were measured with an AOAC method in an automated version of system for flow-injection analysis (FIA-Star, The Tecator Company, Sweden).

## RESULTS AND DISCUSSION

On the basis of concentration distributions mean and extreme (about ninetieth percentile) concentrations have been determined, as in Table 2.

According to the dates from the Central Statistical Department, in 1990 monthly intake of cured meats was (in kilograms): high-quality smoked meats 0.20; other smoked meats 0.11; durable sausages 0.0625; other sausages 1.48; canned meat 0.12; uncured processed meat 0.27. With regard to that monthly and daily intakes have been evaluated (Table 3).

Calculations have shown, that contribution of cured meats to the nitrates intake can be absolutely neglected, because its range is about 1% (from 0.7% to 1.6%). On the contrary, cured meats are important sources of nitrites. According to dates, updated in this Report, it contributes to 66.4% of mean intake and 56.3% of extreme intake and the main source are undurable and half-durable sausages, the most important in a statistical Pole diet. There are changes on the list of cured meats: for nitrates intake they are at least position on the list, behind plant foods; but for nitrites intake there is a change: they are also at first place of intake, but with considerably lower contribution, specially to the extreme intake (decline from 91 to 56%). Detected changes can be explained by more strictly kept norms for the use of curing agents in meat processing, specially in small factories where nitrate curing was exchanged for nitrite curing, because statistical daily intake of cured meat increased in analogous periods of time from 0.066kg to 0.075kg per day.

On the figure (Figure 1) there are demonstrated changes in health authority requirements for maximal nitrite and nitrate concentrations in cooked cured sausages. Right now in Poland it is allowed only to use of nitrate curing in production of raw sausages salami type with low total consumption.

The assessments of nitrate and nitrite can be referred to WHO limits. With assumption that mean customer's body mass is 70kg, the borderlines are 350mg $NaNO_3$ and 14mg $NaNO_2$ (ADI for $NaNO_3$=5mg/kg of body mass and for $NaNO_2$=0.2mg/kg of body mass). So statistical Pole nitrate intake is 1/2 of a safe dose (47%) and nitrite intake is 1/4 of a safe dose (25%). In extreme intake cases the safe dose of nitrates is exceeded over two times (222%), but the contribution of consumed cured meats is negligible. Even extreme intake of nitrites does not exceed safety limit. In that case intake is less than 2/3 of the safe dose (57%).

## REFERENCES

BARYLKO-PIKIELNA, N., KIEREBINSKI, Cz., TYSZKIEWICZ, St. 1984, 1986. *Chemical Food Contaminations as a Result of Environmental Contaminations.* Experts' Report, KTChZ PAN, Warszawa.

BARYLKO-PIKIELNA, N., and TYSZKIEWICZ, St. 1991. *Chemical Food Contaminations.* State and Sources. Experts' Report, KTChZ PAN, Warszawa. 1991.

Table 1. Contribution of various foods to intake of nitrites and nitrates (1987/1988).

| Mean intake % | | | | Extreme intake % | |
|---|---|---|---|---|---|
| Fresh vegetables | 42 | Potatoes | 36 | Fresh vegetables | 56 |
| Drinkable water | 10 | Cured meat products | 6 | Potatoes | 24 |
| Processed vegetables | 4 | Uncured meat | 1 | Cured meat products | 10 |
| | | | | Drinkable water | 6 |
| | | | | Processed vegetables | 2 |
| | | | | Uncured meat | 1 |
| Total | 99 | | | | 99 |

| Mean intake % | | Extreme intake % | |
|---|---|---|---|
| Cured meat products | 77 | Cured meat products | 91 |
| Potatoes | 12 | Potatoes | 4 |
| Fresh vegetables | 6 | Fresh vegetables | 2 |
| Fish | 2 | Fish | 1 |
| Milk | 1 | | |
| Processed vegetables | 1 | | |
| Total | 99 | | 98 |

Table 2. Mean and extreme concentrations of nitrates and nitrites in cured meat products (1992).

| Products | Nitrates NaNO3mg/kg | | Nitrites NaNO2mg/kg | |
|---|---|---|---|---|
| | mean conc. | extreme conc. | mean conc. | extreme conc. |
| Smoked meats: | | | | |
| high quality (ham, loin, butt) | 35 | 170 | 50 | 110 |
| other (belly, bacon) | 50 | 120 | 55 | 135 |
| Sausages: | | | | |
| durable | 40 | 130 | 25 | 55 |
| other | 40 | 70 | 33 | 60 |
| Canned meats: | | | | |
| canned ham canned shoulder | 30 | 60 | 25 | 50 |

Table 3. Monthly and daily intakes of nitrates and nitrites (1992).

| Source | Nitrates intake | | Nitrite intake | |
|---|---|---|---|---|
| | Mean | Extreme | Mean | Extreme |
| Monthly (mg) | | | | |
| Cured meant product: | | | | |
| high quality | | | | |
| smoked meats | | | | |
| other smoked meats | 7.00 | 34.00 | 10.00 | 22.0 |
| durable sausages | 5.50 | 13.20 | 6.05 | 14.85 |
| other sausages | 2.50 | 8.13 | 1.50 | 3.30 |
| canned products | 59.20 | 103.60 | 48.84 | 88.80 |
| Total | 3.60 | 7.20 | 3.00 | 6.00 |
| | 77.80 | 166.13 | 69.39 | 134.95 |
| Daily (mg) | | | | |
| cured meat | 2.6 | 5.5 | 2.31 | 4.50 |
| products | | | | |
| other sources | 162.0 | 771.5 | 1.17 | 3.50 |
| Total | 164.6 | 776.0 | 3.48 | 8.00 |