COMPOSITION OF LIVER PATES. I. DETERMINATION OF *TRANS* FATTY ACIDS, NITRATES AND NITRITES.

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42nd International Congress of Meat Science and Technology
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Keywords: liver pâtés, nitrates, nitrites, *trans* fatty acids

Background

The patterns of Portuguese diet are changing. There are a lot of factors contributing to this issue: a new lifestyle, a wide range of new processed food products in the market, the increasing interest of the population with regard to nutritional labeling and fears concerning undesirable components in food.

Pâtés are not a new processed food, although recently their consumption has been increasing probably due to marketing reasons considering the wide variety and brands on the market. Despite these, a poor work has been done in our country on the evaluation of the composition of these products [1].

Objectives

As a form of health protection, the reduction of the fat ingestion and specifically of *trans* fatty acid contents in the diet are nutritional objectives. In an attempt to inform the population on the nutritional value of liver pâtés and on the potential intake levels of some of the undesirable components carried over by them, this work was developed.

Energy, lipids, proteins, cabohydrate contents and fatty acid composition have been determined.

In the recent years nitrates and nitrites have attracted a great deal of attention because of their potential role in producing nitrosamines in the human body [2] and also for regulamentary reasons [3].

The indispensability of nitrates and nitrites as antimicrobial agents against *Clostridium botulinum* and their abilities to give the desirable characteristics of colour and other organoleptic properties in cured meat justify that the determination of these salts was included in this first approach of pâté study. For determination of these salts a very accurate, rapid and precise methodology by FIA has been used [4].

Methods

Determinations: Water (Drying of the sample at 100 -102° C in air oven (AOAC [5] 24.003); Proteins (Kjeldahl digestion with selenium catalyst (AOAC 2.058); Lipids (Soxhlet extraction (AOAC 24.005); Carbohydrates (Evaluation was made by calculation); Fatty acid composition and *trans* fatty acids - GLC/FID Analysis was used [6]. A Chromatograph Pye Unicam fitted with a flame ionization detector (FID) and a 0,25mm x 50m fused silica capillary column coated with CP-Sil 88 (Chrompack) was used for separation of fatty acids methyl esters. The column was maintained at 185° C. 1:50 was the split ratio and the injected volume was 1ml. Peak areas were processed by using a Pye Unicam CDP4 computing integrator.

The methyl esters were prepared by transesterification with BF3/MeOH. Before metilation the samples were hydrolysed with KOH/MeOH (11g/l) and the methyl esters were extracted with n-heptan; Nitrates and nitrites - A multidetection flow injection system was used for the automatic sequential determination of nitrate and nitrite. This provided an alternative method of analysis to perform the conventional instrumental methods automatically, with considerable time saving. After injection the sample plug is divided. An on-line copper-cadmium reductor column reduces nitrate to nitrite in part of the sample plug. Spectrofotometric determination of nitrite and nitrite plus nitrate is made after a diazotization-coupling reaction. This allows the sequential determination of nitrite and nitrate present in different concentration ranges in the sample with only one detector.

Sampling

3 lots of 5 brands of liver pâtés in a total of 15 samples were randomly purchased from the local market.

Results and Discussion

Table 1 summarises the results of water, proteins, fat, carbohydrates, *trans* fatty acids, nitrates, nitrites contents and caloric value of the 5 commercial brands of liver pâtés analysed in the total of 15 samples.

The European Community legislation for liver pâtés allows 100 mg/kg for residual nitrites (expressed as $NaNO_2$) and 250 mg/kg for residual nitrates (expressed as $Na\ NO_3$). Under optimal conditions for the nitrates' and nitrites' analyses [4] the levels are ranging from 4.9mg/kg ±1.10 to 22.3mg/kg ±0.16 and from 11.73mg/kg ±0.088 to 130.1mg/kg ±0.016, respectively. A dispersion ($p < 0.01$) around the mean values was observed and for some brands it was significant. Despite the small sampling the results found show that in terms of averages the levels of concentrations of these constituents are below the allowable limits.

Concentrations of *trans* fatty acids are scarce in all samples (ranging from 0.37% ±0.049 to 1.64% ±0.025) when compared with levels determined in other fatty foods [6]. A significant dispersion in the results was observed in some brands.

The great variability pertaining to the *trans* fatty acids, nitrate and nitrite contents may indicate a poor uniformity of manufactoring within the same brand.

Conclusions

In terms of contents of nitrites, nitrates and*trans* fatty acids the liver pâtés are safe. Although being unbalanced foods and highly energetic is recommended that liver pâtés should be consumed with moderation.

References

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Table 1: Contents of water, protein, fat, carbohydrates, *trans* fatty acids, nitrates, nitrites and energy of 5 commercial brands of liver pâtés in the total of 15 samples.

Liver Pâté[1] Brand / lot	Water (x ± sd) %	Protein (x ± sd) %	Carbohydrate (x ± sd) %	Fat (x ± sd) %	*trans* fatty acids (x ± sd) %	Nitrite mg/kg	Nitrate mg/kg	Energy KJ/100
1	47 ± 0.0	9 ± 0.7	3 ± 0.1	41 ± 0.0	1.03 ± 0.012 *	4.9 ± 0.10	33.7 ± 6.38	1745
A 2	48 ± 0.2	9 ± 0.5	3 ± 0.3	40 ± 0.0	0.87 ± 0.110	5.1 ± 0.37	53.9 ± 4.71	1707
3	46 ± 0.0	7 ± 0.5	4 ± 0.5	42 ± 0.4	1.64 ± 0.025	5.3 ± 0.11	38.2 ± 5.37	1912
4	53 ± 0.1	16 ± 0.2	8 ± 0.1	23 ± 0.0	0.50 ± 0.060	13.7 ± 0.11 *	130.3±16.06	1268
B 5	57 ± 0.7	16 ± 0.0	8 ± 0.7	20 ± 1.4	0.37 ± 0.049	12.5 ± 0.10	114.9 ± 8.91	1155
6	52 ± 0.1	16 ± 0.3	7 ± 0.1	25 ± 0.0	0.42 ± 0.031	12.7 ± 0.28	123.7 ± 9.65	1326
7	50 ± 0.0	12 ± 0.1	6 ± 0.6	33 ± 0.7	1.28 ± 0.066 *	9.4 ± 1.16	25.2 ± 5.93	1544
C 8	51 ± 0.0	13 ± 0.5	4 ± 0.2	32 ± 0.7	1.41 ± 0.059	10.4 ± 0.09	28.8 ± 4.46	1490
9	48 ± 0.0	13 ± 0.2	4 ± 0.9	36 ± 0.7	0.79 ± 0.006	9.4 ± 0.37	39.3 ± 5.58	1640
10	49 ± 0.0	10 ± 0.1	6 ± 0.1	35 ± 0.0	0.57 ± 0.017	7.5 ± 0.58	58.3 ± 0.62	1586
D 11	45 ± 0.0	11 ± 0.5	14 ± 0.2	31 ± 0.7	0.43 ± 0.092	10.3 ± 1.00	54.1 ± 1.20	1586
12	48 ± 0.0	11 ± 0.3	7 ± 0.3	34 ± 0.0	0.47 ± 0.064	14.0 ± 1.51	55.6 ± 3.25	1582
13	54 ± 0.0	13 ± 0.4	5 ± 0.0	28 ± 0.4	0.61 ± 0.113 *	11.7 ± 0.35 *	35.5 ± 0.96 *	1356
E 14	55 ± 0.0	10 ± 0.6	6 ± 0.8	29 ± 0.1	0.73 ± 0.069	11.8 ± 0.11	32.0 ± 2.24	1360
15	53 ± 0.0	11 ± 0.4	6 ± 0.1	31 ± 0.3	1.25 ± 0.102	22.3 ± 0.16	11.7 ± 0.89	1452

[1] A, B, C, D, E - are different brands of commercial pâtés liver, the numbers represent different lots.

* Significant differences between the results were determined by ANOVA methodology followed by Fisher's PLSD test. Differences were considered significant for $p < 0.01$.