TBARS ANALYSIS IN PRESSURIZED AND HEAT-TREATED POULTRY

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Background.

Lipid oxidation has been demonstrated to occur during food processing, especially in the case of heat treatment. However, this phenomenon has not been thoroughly investigated when samples are treated with high pressure. It seems that changes leading to catalysis of lipid oxidation in pressure-treated pork meat start around 300 MPa at room temperature *(Cheftel and Culioli, 1997)*. Regarding poultry, there is little research done by now. *Dissing* et al. *(1997)* developed a mathematical model to predict oxidative changes in pressurized turkey thigh. It is necessary to clarify the oxidative stability of pressurized poultry and to compare it with that of heat-treated, in order to take advantage of high pressure technology.

Objective.

To quantify the thiobarbituric acid reactive substances (TBARS) formed in raw and over-cooked minced poultry, the day after high pressure processing and during chill storage.

Methods.

Poultry thighs were obtained from a local supermarket. Thighs were deboned and, before mincing, skin, connective tissue and subcutaneous fat was removed. Raw or over-cooked (100ºC for 1 h) samples of minced poultry were vacuum-packaged in plastic bags (Cryovac Packaging, Sant Boi de Llobregat, Spain) and, immediately after packaging, pressurised at 500 MPa for 30 min at 50º C (RP, OP) or heat-treated in a water bath at 50ºC for 30 min (RB, OB). Untreated samples of raw (RU) and over-cooked (OU) poultry were reserved. All samples were stored in the darkness at 4ºC.

For high pressure processing, a discontinuous isostatic press (ALSTOM, Nantes, France) was used. The pressure chamber (22 cm height, 10 cm diameter) and the liquid inside were held at the appropriate temperature, monitored with a thermocouple, by circulating hot water. Minced poultry packages were allowed to reach the treatment temperature in this chamber before pressurization. After processing, they were cooled in running tap water for 30 seconds.

The AOAC official methods of analysis *(McNeal, 1990)* were applied to determine raw poultry composition.

TBARS analysis was performed 1, 6 and 9 days after treatments using the extraction method of *Botsoglou* et al. *(1994)*. Butylated hydroxytoluene at 0.08% in hexane was added to all samples to protect them against the oxidation induced by the analytical procedure. The analysis was performed three times. Absorbance was measured at 521 nm in the third derivative spectra produced by electronic differentiation of the normal spectra. Results are expressed in malondialdehyde (MDA) ppb, although other TBARS are obviously included in these numbers.

Results and discussion.

Immediately after mincing pH of raw poultry was 6.41, and its composition was: total solids, 25.01%; fat, 4.10%; total nitrogen, 3.17%; ash,1.09%.

TBARS values in over-cooked samples were 10-fold higher than those in raw samples, both in untreated and in pressurized and heat-treated poultry. General trend in all samples was an increase in TBARS values when maintained under storage at 4ºC, but a different oxidation speed was observed depending on the treatment.

In raw poultry meat, TBARS values of RU and RB samples were really close. The increasing rate of these values was slow: at the end of the experiment they increased only 20% compared with the initial values. The behaviour of RP samples was absolutely different. One day post-treatment they presented a MDA concentration similar to that of the other raw samples; but 6 days after pressurization, MDA ppb increased almost 140%. However, increasing rate of RP samples changed at that point because 3 days later the value only increased 4.8% compared with values obtained at 6 days of chill storage. *Cheah and Ledward (1995 and 1996)* worked with pork meat and also observed that pressurized samples oxidised more rapidly than untreated ones by measuring TBARS values. Quantitative data are no comparable because of the different species and analytical procedure.

In over-cooked poultry, OP samples had much higher initial TBARS levels. In this case, OU and OB samples appeared to have equivalent secondary oxidation product levels during all the experiment. Differences in TBARS value evolution slopes of OU, OB and OP samples were less marked than the ones observed in raw samples. This was possibly due to the fact that oxidation was previously induced in over-cooked samples by severe heat processing. OP samples showed TBARS values higher than OU and OB samples during chill storage. TBARS values of non pressurized over-cooked samples at the end of the study increased 180% compared with the values from one day after treatments, whereas OP samples values just increased 92%.

Conclusions.

Over-cooking induces much greater oxidation in poultry than high pressure processing. There is not apparent synergism between over-cooking and high pressure in producing secondary oxidation products. It is assumable that conventional heat treatment would cause an intermediate effect.

Pressurised samples have a faster oxidation induction than raw samples, but this oxidation is not so marked as that induced by over-cooking. Secondary oxidation products do not have a constant synthesis speed but it decreases during chill storage.

Pertinent literature.

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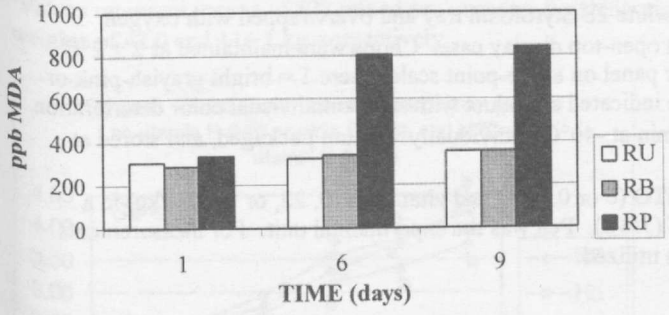
	1 day	6 days	9 days
RU	306,30	326,17	356,35
RB	289,17	338,50	359,24
RP	333,99	801,65	840,11
OU	2022,70	3448,06	4967,34
OB	1589,43	4253,55	5147,93
OP	3848,19	7159,80	7396,69

TBARS EVOLUTION IN RAW POULTRY MEAT



TBARS EVOLUTION IN OVER-HEATED POULTRY MEAT