

EFFECT OF STORAGE ON CHOLESTEROL OXIDATION IN TYPICAL LIVER SAUSAGE „PASZTETOWA”

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Background

Cholesterol, an essential component of animal tissue, is well known to be susceptible to oxidation (Smith, 1981, 1987; Maerker, 1987), and cholesterol oxidation products have been detected repeatedly in animal – derived food products (Nourooz – Zadeh & Appelquist, 1989; Park & Addis, 1987). Cholesterol oxide products (COPs) shown to be toxic to cells (Ansari et al., 1982, Hughes et al., 1994, Guardiola et al., 1996) and possibly associated with coronary heart disease (Brown & Jessup, 1999). These COPs are formed in foods subjected to common processing conditions such as shredding, mincing, mixing and storage (Gray, Gomaa & Buckley, 1996). Cholesterol oxidation is a free radical mechanism, similar to oxidation of unsaturated fatty acid (Navar, 1985). Both unsaturated fatty acid autooxidation and cholesterol autooxidation were proceed by a free radical process. The most common cholesterol oxidation products encountered in nature are 7 – ketocholesterol (3 β - hydroxycholest – 5 – en – 7 – one), 7 β - hydroxycholesterol (cholest – 5 – ene - 3 β , 7 β - diol). Meat and meat products are the main source of consumed cholesterol and oxysterols. Information on the oxysterols in Polish meat products is still incomplete.

Objectives

The objective of this study was to monitor the storage stability of cholesterol and two oxysterols in most popular Polish liver sausage „pasztetowa”, and to correlate with other oxidation markers.

Materials and methods

Sausage was produced on the commercial scale in the large plant located in Poznań. The sausage was stored during 10 days, at 4°C, without availability of light. The proximate analysis was made according to Polish Standards. Cholesterol content ($\mu\text{g}/\text{lg}$ of sample) and oxysterols (% of total oxides) content were measured following the GC and GC/MS procedure described by Przygoński et al. (2000). The following main products of cholesterol oxidation were determined: 7 – ketocholesterol (7 keto C), 7 β hydroxycholesterol (7 β - OH - C). Sum of oxysterols was given as the total amount of following oxysterols: 7 α -OH-C, 7 β -OH-C, α epoksy-C, β epoksy-C, 20 α -OH-C, triol-C, 25 OH-C, 7 keto-C and 27 OH-C. The rate of oxidative and hydrolitic changes of fat in sausages was assessed by determination of peroxide value, acid value and TBA value. The peroxide value (PV) was measured by the method described by Charzyński (1963), acid value (H) was measured according to Polish Standard (PN-74/R-66165) and TBA value (TBARS) described by Pikul et al. (1989).

Results and Discussion

Statistical analysis showed significant influence of time storage onto peroxide value (Fig. 1) and total sum of oxysterols (Fig. 6). Particular high significant influence of time storage onto 7 β - OHC (Fig. 5) and 7 – ketocholesterol (Fig. 4) was found. The progress of storage time (at 4°C) caused on immediate increase in all analysed parameters. The high correlations for regressions: sum of oxysterols = f (PV) (Fig. 2) and sum of oxysterols = f (cholesterol) (Fig. 3) were founded. The increase of total sum of oxysterols was the same as peroxidation value of lipids, what might show the similarity of the changes which both lipids and cholesterol undergo. Instead, where the level of oxysterols increased the cholesterol contents decreased. This confirms the correlation between the cholesterol and oxysterols sum level. Decrease of cholesterol level during storage of the sausage resulted from its oxidation and generation of cholesterol oxidation products.

Fig. 1. Correlation of storage time with peroxide values for sausage „pasztetowa” type, stored 1,3,6,8 and 10 days at 4°C.

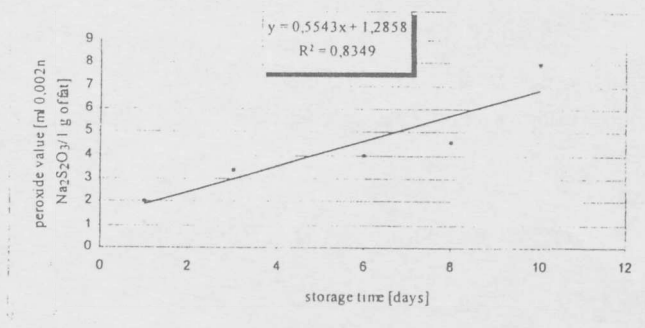


Fig. 2. Correlation of peroxide value with sum of oxysterols for sausage „pasztetowa” type, stored 1,3,6,8 and 10 days at 4°C.

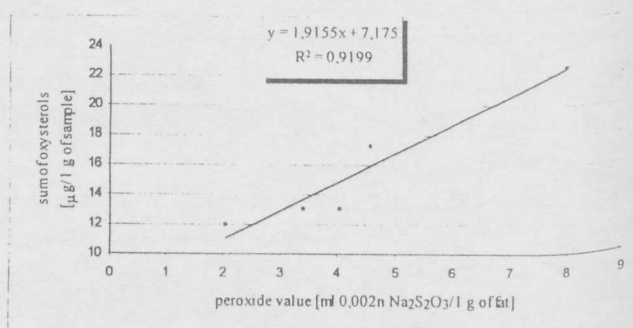


Fig. 3. Correlation of cholesterol value with sum of oxysterols for sausage „pasztetowa” type, stored 1,3,6,8 and 10 days at 4°C.

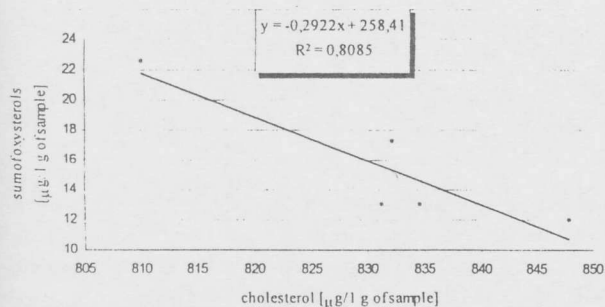


Fig. 4. Correlation of storage time with 7 keto - C values for sausage „pasztetowa” type, stored 1, 3, 6, 8 and 10 days at 4°C.

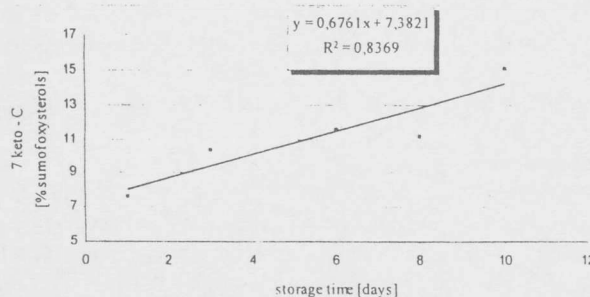


Fig. 5. Correlation of storage time with 7β - OHC values for sausage „pasztetowa” type, stored 1,3,6,8 and 10 days at 4°C.

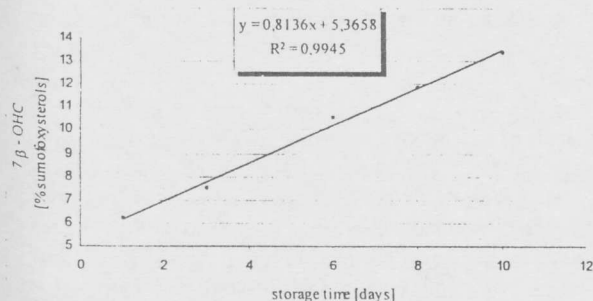
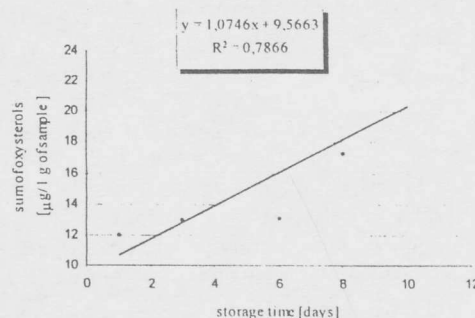


Fig. 6. Correlation of storage time with sum of oxysterols for sausage „pasztetowa” type, stored 1,3,6,8 and 10 days at 4°C.



Conclusions:

1. Storage time affects the sum of oxysterols. It is especially highly correlated with two oxysterols: 7 keto-C, 7 β-OHC,
2. Lipids peroxidation (PV) was significantly correlated with sum of oxysterols,
3. Decrease of cholesterol level was correlated with increase of both analyzed oxysterols and sum of oxysterols.

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