

Cholesterol and cholesterol oxidation in the tissues of chicken and rabbits fed with oxidized lipids

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Objective

To assess the effect of dietary oxidized lipids on the levels of cholesterol and formation of cholesterol oxidation products (COP) in chicken and rabbit tissues.

Background

Cholesterol and saturated fatty acids may play a significant role in atherosclerosis and cardiovascular diseases. Cholesterol oxidation products (COP) can be formed in all animal tissues. Dietary COP have become a matter of concern for several health implications such as cardiovascular disease, atherosclerosis, cancer, diabetes, nutritional disorders and other pathological conditions (1-3). It is reported that oxidized cholesterol is more atherogenic than unoxidized cholesterol (4). Different feed formulations and oxidized cholesterol may alter the levels of cholesterol and COP in the animal tissues (4). Several studies have confirmed that the formation of COP in animal products is multifactorial including storage, cooking processing, etc. (1,4). The aim of this study was to show how different levels of oxidized sterols in feeds effect the levels of cholesterol and COP in the tissues of chicken and rabbit.

Results

- Feeds with highly oxidized lipids contained about 4 times more sterol oxidation products (SOP) compared with feeds containing low oxidized lipids (Table 1).
- Considerably higher levels of cholesterol and COP were present in all the tissues of chicken and rabbit from highly oxidized lipid feeds compared with low and medium oxidized lipid feeds (Figures 3-8).
- The quantified COP present in tissues from highly oxidized feed fed chicken and rabbit were: 7 α -hydroxycholesterol(7 α -HC), 7 β -hydroxycholesterol(7 β -HC), a and b epoxycholesterol(CE) cholesteroltriol(CT), 25-hydroxycholesterol(25-HC) and 7-ketcholesterol(7-KC).
- 7 α -HC, 7 β -HC and 7-KC were dominating COP in muscle and liver tissues, whereas CE and 25-HC were the main COP in plasma of chicken and rabbit.

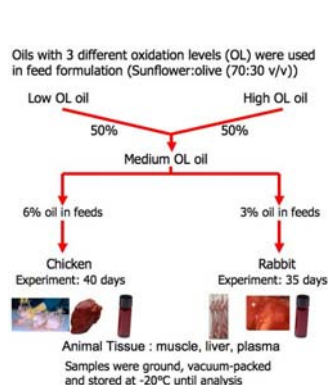


Figure 1: Design of feeding trials

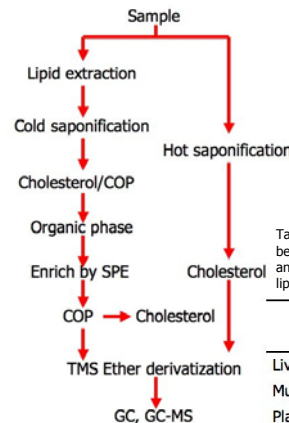


Figure 2: Flowchart of the analytical methods

Table 1: Content of sterols and sterol oxidation products (SOP) in the feeds

Feed	Chicken		Rabbit	
	Sterol (mg/100g)	SOP (μ g/100g)	Sterol (mg/100g)	SOP (μ g/100g)
Low OL	5.4	178.6	2.7	89.3
Medium OL	5.0	453.1	2.5	226.5
High OL	4.6	727.6	2.3	363.8

Table 2: R-Squared (R^2) value showing the relationship between cholesterol/cholesterol oxidation products (COP) in animal tissues and feeds with different levels of oxidized lipids.

	Chicken		Rabbit	
	Cholesterol	COP	Cholesterol	COP
Liver	0.8848	0.9587	0.8952	0.9999
Muscle	0.9967	0.8668	0.9995	0.8684
Plasma	0.9700	0.9589	0.9932	0.9615

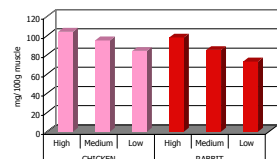


Figure 3: Content of cholesterol in the muscle from feeding trials with oxidized lipids

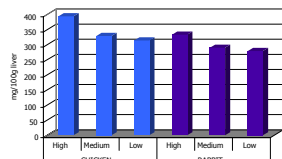


Figure 4: Content of cholesterol in the liver from feeding trials with oxidized lipids

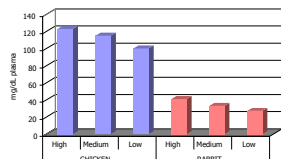


Figure 5: Content of cholesterol in the plasma from feeding trials with oxidized lipids

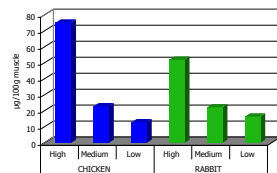


Figure 6: Content of cholesterol oxidation products (COP) in the muscle from feeding trials with oxidized lipids

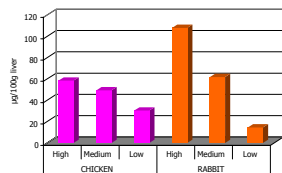


Figure 7: Content of cholesterol oxidation products (COP) in the liver from feeding trials with oxidized lipids

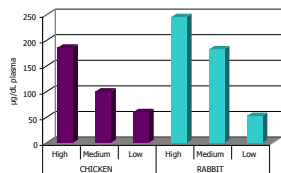


Figure 8: Content of cholesterol oxidation products (COP) in the plasma from feeding trials with oxidized lipids

Conclusions

- Oxidized sterols in feeds enhanced the levels of cholesterol and COP in animal tissues.
- COP tend to concentrate in the liver compared with muscle and plasma.
- Oxidized oils in feed formulations might affect the quality of animal products for human consumption.

References

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Acknowledgement

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