

ESTIMATION OF MALONDIALDEHYDE LEVELS IN CANNED MILK, YOGHURT, AND CREAM IN BAGHDAD CITY AS AN OXIDATIVE FACTOR

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ABSTRACT:

An investigation into the concentrations of Malondialdehyde (MDA) in milk, yogurt and cream from various Baghdad supermarkets was the goal of this study. The results of this study show that out of a total of 125 samples, 45 (36 %), 14 (11.2 %), and 17 (13.6 %) positive samples were randomly collected from milk, yogurt, and cream from various supermarkets. Al-Ghazaliya and Abu Ghraib were found to have a significant ($p \leq 0.05$) difference in the mean value of MDA in milk samples (3.8140.416 and 3.9311.422 $\mu\text{mol/l}$). Some samples, such as those from Yarmouk in yogurt and Mansour, Al-Ghazaliya and Abu Ghraib in Cream samples, contained 7.322–2.311 $\mu\text{mol/l}$. Because of the importance of dairy products in human nutrition, this investigation is necessary. Infrequently, as a result of our import and the wide variety of sources from which it is derived. Mutagenic and cytotoxic effects on human health are possible side effects of MDA exposure.

Key word: Malondialdehyde MDA, dairy, food, human health

INTRODUCTIONS:

There has long been an association between the consumption of milk and It is one of the most widely consumed foods on the planet due to its overall health benefits. Because of the wide range of nutrients, it contains, milk has long been considered a healthful beverage (Ware and Wilson, 2017). All nine essential amino acids are present in this high-quality protein source, which may help to reduce muscle loss and promote muscle repair as we get older. Calcium, vitamin D, phosphorus, and magnesium are just some of the nutrients found in milk that help maintain bone health. Lipid damage produces numerous harmful byproducts, one of which is malondialdehyde (MDA) (Aubourg 1993) Because of an imbalance between the amount of ROS (Reactive oxygen species) and the number of antioxidant molecules available, anyone can get a wide range of infections (Miller *et al.*, 1993 and Brzezinska-Slebodzinska *et al.*, 1994). Peroxidation causes tissue damage and changes in the levels of reduced glutathione (GSH) that are linked to glutathione metabolism. When the balance between pro and antioxidants is out of whack, this leads to oxidative and the predominance of oxidation processes in dairy cows, which causes metabolic disorders and disease. (Sharma *et al.*, 2011). Peroxidation causes tissue damage and changes in the levels of reduced glutathione (GSH) that are linked to glutathione metabolism. When the balance between pro and antioxidants is out of whack, this leads to oxidative and the predominance of oxidation processes in dairy cows, which causes metabolic disorders and disease.. (Kubow, 1992). Primarily oxidation products like hydrogen per-

oxide oxides and other oxygenated compounds are commonly assumed to be the norm when oxygen reacts with a wide variety of organic substrates in nature. Photos, auto-oxidation, and metals can all cause oxidation, but these three are the three main types of LOs that have an impact on milk and milk products. (Gutierrez 2014). The rate of autoxidation is sped up by making the alkyl chain more unsaturated (Frankel 1998). To make yogurt, milk is heated and then homogenized, followed by the addition of lactic acid bacteria. (LAB)(US FDA-DHHS, 2011)

MATERIALS AND METHODS:

Sample collections: One hundred twenty-five samples were taken from various supermarkets around Baghdad, including Mansour, Amriyah, Al-Ghazaliya and Yarmouk; twenty-five samples each of milk, yogurt, and cream were taken. All of the samples were transported to the veterinary public health laboratory in ice boxes for testing.

Determination of Malondialdehyde (MDA): According to the Buege and Aust method, the serum MDA concentration was determined (Buege and Aust, 1978). Polyunsaturated fatty acid breakdown produces MDA, which can be used to measure the rate of peroxidation. Thiobarbituric acid (TBA) was used to estimate the MDA, which reacts with TBA to produce a pink color that can be read at 535 nm. (Nur, *et al.*, 2013)

B. Reagents: Hydrochloric acid (HCl) was used to dissolve the thiobarbituric acid and tri-chloro acetic acid (TCA) in a suitable volume, and they mixed it and heated it to 70°C until the thiobarbituric acid and TCA were completely dissol-

ved. The volume was then made up to 100 ml with HCL solution (0.25N).

C. Procedure

1. 0.5 ml of serum was mixed with 1 ml of the reagent and 1 ml of reagent.
2. For 20 minutes, the tube was heated to 70 °C and thoroughly mixed by vortex.
3. A microfuge, centrifuge was used to centrifuge the mixture for 10 minutes at (6000 rpm) after it had cooled

The supernatant was measured at a maximum of 535 nm against a blank containing 1 ml of D.W. and 0.5 ml of reagent.

D. Calculation of Results

$$\text{Serum MDA concentration } (\mu\text{mol/l}) = \frac{\text{Abs} \times \text{D.F}}{\varepsilon \times \text{d}}$$

Abs: absorbance

d: light path = 1 cm

D. f: dilution factor = 3

ε : extinction coefficient = $1.56 \times 10^5 \text{M}^{-1} \text{cm}^{-1}$

RESULTS AND DISCUSSION:

Table 1 shows that of the 125 samples collected from various locations in Baghdad, 45 (36 %), 14 (11.2 %), and 17 (13.6 %) respectively came from yogurt, milk, and cream. According to the static analysis, MDA contamination in yogurt samples is significantly higher (0.05) than in cream and milk samples (17.6%) and (14.6%), respectively (11.2 %). Compared to Al-13.4% Ghazaliya's and Abu Ghraib's 8.84%, there was a significant (0.05) difference in MDA contamination in yogurt at Al-Ghazaliya and Abu Ghraib, respectively, of 13.4% and 11.8%. MDA contamination of milk in Al-Ghazaliya 7 (5.6 %) differs from that of Abu Ghraib 4 (3.2 %), Yarmouk 1 (0.8 %), and Amriya 2 (1.6 %), all of which had similar %ages. MDA contamination in Cream in Abu Ghraib 7 (5.6 %) compares to Al-Ghazaliya 3 (2.4 %), Yarmouk 2 (1.6 %), Amriya 4 (3.2 %), and Mansour 1 (0.8 %) respectively.

Table 1: prevalence of MDA in cream, milk and yogurt from different locations in Baghdad city.

Samples Location	Number of samples	Yogurt No. of positive samples	Milk No. Of positive samples	Cream No. of positivesamples
Mansour	25	3 (2.4%)	0	1(0.8%)
Amriya	25	6(4.8%)	2(1.6%)	4(3.2%)
Al-Ghazaliya	25	13(10.4%)	7(5.6%)	3 (2.4%)
Yarmouk	25	9(7.2%)	1(0.8%)	2(1.6%)
Abu Ghraib	25	11(8.8%)	4(3.2%)	7(5.6%)
Total samples	125	45(36%)	14(11.2%)	17(13.6%)

This study found significant ($p \leq 0.05$) differences in the mean value of MDA in milk samples (table 2) from Al-Ghazaliya and Abu Ghraib, which were 3.814–0.416 and 3.931–1.422– $\mu\text{mol/l}$, respectively, compared to samples from Amriya, Mansour, and Yarmouk. According to the results, there were significant ($p \leq 0.05$) high differences in the mean value of MDA between Yarmouk samples in yogurt and Ghazaliya samples (4.6280.327 $\mu\text{mol/l}$), Abu Ghraib samples (4.5521.614 $\mu\text{mol/l}$), Mansour samples (4.4682.128 $\mu\text{mol/l}$), and Amriya samples (5.3561.737). The static analysis shows that the mean MDA concentrations in the cream samples from Mansour, Al-Ghazaliya, and Abu Ghraib were significantly higher ($P \leq 0.05$) than those in Amriya and Yarmouk, with concentrations of 0.826 0.27 $\mu\text{mol/l}$, 0.723 0.212 $\mu\text{mol/l}$,

and 0.831 0.30 $\mu\text{mol/l}$, respectively. As can be seen from the data, (Pereda, *et al.*, 2008). The mean MDA concentration in raw milk was 0.0105 0.0004 g/ml, which is extremely low. While (Rinaldi, *et al.*, 2021) found that MDA concentration was 0.67 and 1.22 nmol/g in fresh crud and frozen crude. (Tripaldi, *et al.*, 2020) The MDA values reported in cheese (1.51 nmol/g) are worth noticing. To date, studies have shown that exposure of human blood cells to MDA at just 50 micromolars resulted in significant depletion of oxygenated haemoglobin and reduced glutathione, as well as an early deterioration in the redox state of these cells. (Tesoriere, *et al.*, 2002). There is an increased risk of cancer and cardiovascular disease with the consumption of foods with lipid peroxidation products. (Okolie, *et al.*, 2009).

Table 2: The concentration of MDA in Cream, Milk and Yogurt ($\mu\text{mol/l}$) from different locations.

Source	Milk $\mu\text{mol/l}$	Yogurt $\mu\text{mol/l}$	Cream $\mu\text{mol/l}$
Mansour	2.799 \pm 2.41B	4.468 \pm 2.128C	0.826 \pm 0.27A
Amriya	2.941 \pm 2.469B	5.356 \pm 1.737B	0.488 \pm 0.303B
Al-Ghazaliya	3.814 \pm 0.416A	4.628 \pm 0.327C	0.723 \pm 0.212A
Yarmouk	2.531 \pm 2.620B	7.322 \pm 2.311A	0.437 \pm 0.310B
Abu Ghraib	3.931 \pm 1.422A	4.552 \pm 1.614C	0.831 \pm 0.30A

Conclusion

The increase in the value of MDA in food can be attributed to storage or transportation issues. To reduce the amount of MDA in your food, choose a cool, dry area to store it.

REFERENCE

- Boroski, M., Giroux, H. J., Sabik, H., Petit, H. V., Visentainer, J. V., Matumoto-Pintro, P. T., & Britten, M.,** Use of oregano extract and oregano essential oil as antioxidants in functional dairy beverage formulations. *LWT-Food Science and Technology* 47(1): 167-174 (2012).
- Brzezinska-Slebodzinska, E., Miller, J.K., Quigley III, J.D., Moore, J.R., & Madsen, F.C.,** Antioxidant status of dairy cows supplemented prepartum with vitamin E and selenium. *Journal of Dairy Science* 77(10): 3087-3095 (1994).
- Frankel, E.N. (1998).** Lipid Oxidation The Oily Press: Dundee.
- Gutierrez, A.M. (2014).** *Effects of lipid oxidation initiators and antioxidants on the total antioxidant capacity of milk and oxidation products during storage* (Doctoral dissertation, Iowa State University).
- Kubala, J. (2018).** 5 Ways that Drinking Milk Can Improve Your Health. Retrieved: <https://www.healthline.com/nutrition/milk-benefits>
- Kubow, S. (1992).** Routes of formation and toxic consequences of lipid oxidation products in foods. *Free radical biology and medicine* 12(1), 63-81.
- Mikulková, K., Kadek, R., Filípek, J., & Illek, J.,** Evaluation of oxidant/antioxidant status, metabolic profile and milk production in cows with metritis. *Irish Veterinary Journal* 73(1): 1-11 (2020).
- Miller, J.K., Brzezinska-Slebodzinska, E., & Madsen, F.C.,** Oxidative stress, antioxidants, and animal function. *Journal of dairy science* 76(9): 2812-2823 (1993).
- Okolie, N.P., Akioyamen, M.O., Okpoba, N., & Okonkwo, C.,** Malondialdehyde levels of frozen fish, chicken and turkey on sale in Benin City markets. *African Journal of Biotechnology*, 8(23): (2009).
- Pereda, J., Ferragut, V., Quevedo, J.M., Guamis, B., & Trujillo, A.J.,** Effects of ultra-high-pressure homogenization treatment on the lipolysis and lipid oxidation of milk during refrigerated storage. *Journal of Agricultural and Food Chemistry* 56(16): 7125-7130 (2008).
- Rinaldi, S., Palocci, G., Di Giovanni, S., Iacurto, M., & Tripaldi, C.,** Chemical Characteristics and Oxidative Stability of Buffalo Mozzarella Cheese Produced with Fresh and Frozen curd. *Molecules* 26(5): 1405 (2021).
- Sharma, N., Singh, N. K., Singh, O. P., Pandey, V., & Verma, P.K.,** Oxidative stress and antioxidant status during transition period in dairy cows. *Asian-Australasian Journal of Animal Sciences* 24(4): 479-484 (2011).
- Tesoriere, L., D'Arpa, D., Butera, D., Pintaudi, A.M., Allegra, M., & Livrea, M.A.,** Exposure to malondialdehyde induces an early redox unbalance preceding membrane toxicity in human erythrocytes. *Free Radical Research* 36(1): 89-97 (002).
- Ware, M., Wilson, D. R. (2017).** All About Milk. Retrieved: <https://www.medicalnewstoday.com/articles/273451.php>
- Wullepit, N., Raes, K., Beerda, B., Veerkamp, R.F., Fremaut, D., & De Smet, S.,** Influence of management and genetic merit for milk yield on the oxidative status of plasma in heifers. *Livestock Science* 123(2-3): 276-282 (2009).