World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

Check for updates

AFLATOXIN M1 LEVELS IN MILK SOLD AT MARKETS IN ABIDJAN (CÔTE D'IVOIRE)

Aholia Jean-Baptiste Adepo [1,*], Pierre Manda [2], Vincent de Paul Kouamé [2], Jean Simon Thodhekes [3], Koko Alexandre N'bra [3], Kouakou Brou [1] and Sébastien Dano Djédjé [2]

[1] Laboratory of Nutrition and Food Safety, Faculty of Food Science and Technology, University of Nangui ABROGOUA, 02 BP 801 Abidjan 02, Côte d'Ivoire.
[2] Laboratory of Toxicology and Agro-Industrial Hygiene, Faculty of Pharmaceutical and Biological Sciences, University of Félix Houphouët Boigny, B PV 34 Abidjan, Côte d'Ivoire.
[3] Laboratory of Nutrition of the National Institute of Public Health, BP V 47 Abidjan 01, Côte d'Ivoire.
* Corresponding Author

ORCID Details
Aholia Jean-Baptiste Adepo: https://orcid.org/0000-0003-1258-0703
Pierre Manda: https://orcid.org/0000-0003-3506-9246
Kouakou Brou: https://orcid.org/0009-0005-1005-3143

World Journal of Advanced Research and Reviews, 2026, 32(02), 1055–1063

Publication history: Received on 03 October 2026; revised on 14 November 2026; accepted on 17 November 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.32.2.2876

Copyright © 2026 Author(s) retain the copyright of this article. This article is published under the terms of the Creative Commons Attribution License 4.0

ABSTRACT

Aflatoxin M1 (AFM1) contamination in milk is a major public health concern given the carcinogenic effects this mycotoxin has on human health. The aim of this study was to assess the level of AFM1 contamination in milk sold in markets in Abidjan. Sixty (60) samples of the two most commonly consumed types of imported milk were collected from markets in four municipalities in the Abidjan district. Thirty (30) samples were of liquid milk and thirty (30) another samples were of powdered milk. In addition, 30 samples of locally produced raw cow's milk were collected. AFM1 in these samples was extracted and purified using an immunoaffinity column, then quantified using HPLC with a fluorescent detector. The limit of quantification for aflatoxin M1 in milk was 5 ng/kg. All three types of milk analyzed were contaminated with AFM1 at levels ranging from 11 to 163 ng/kg. The average concentrations of AFM1 in liquid milk, powdered milk, and raw cow's milk were 47± 19 ng/kg, 67 ± 35 ng/kg, and 121± 45 ng/kg, respectively. The proportions of liquid milk, powdered milk, and raw cow's milk contaminated above the maximum permissible level of 50 ng/kg set by the European Union were 16.7 %, 26.7 %, and 36.7 %, respectively. Strengthening control measures and rigorously enforcing regulations on imported and locally produced milk and dairy products is essential to ensuring food safety for consumers.

Keywords: Aflatoxin M1; Milk; HPLC; Côte d'Ivoire

1 INTRODUCTION

Milk is an essential food, rich in nutrients and widely consumed by all age groups worldwide. It provides key nutritional and immunological ingredients for both adults and children (Campagnollo et al., 2016 ; Jaiswal et al., 2018 ; Awaisheh et al., 2019 ; Alahlah et al., 2020). In Côte d'Ivoire, milk consumption is growing rapidly and cannot be met by local production, estimated at 34,109 tons in 2019 (Chatellier, 2020 ; FAO, 2022). To make up for this shortfall, the country imports more than 80 % of its dairy and dairy product requirements (Dovonou, 2018 ; Tondel, 2019). However, as in many developing countries, these imported or locally produced milks may be contaminated with certain toxic substances, including aflatoxin M1 (Iqbal et al., 2015 ; Safwan, 2020). This metabolite is produced in the liver of mammals following the ingestion of food contaminated with AFB1. The precursor of AFM1, is mainly produced by mold strains of the Aspergillus genus: *Aspergillus parasiticus*, *Aspergillus flavus*, and *Aspergillus nomius* (Shahbazi, 2017; Assaf et al., 2019). These molds are mainly found in tropical and subtropical regions where climatic conditions, particularly high temperatures and high humidity, favor their development and proliferation (Dieme et al., 2017 ; Houissa, 2020). The production of aflatoxins by mold can occur at any stage of the agricultural value chain, from pre-harvest to storage (Torres et al., 2014 ; Barkai-Golan et al., 2008). AFM1, which is produced by the hydroxylation of aflatoxin B1 by cytochromes P450 (CYP1A2), is secreted into mammalian milk 2 to 3 days after its formation (Campagnollo et al., 2016 ; Marchese et al., 2018 ; Barreto et al., 2019). The presence of AFM1 in milk is a cause of great concern for industry and consumers alike, given its toxic effects on human health. This mycotoxin has been reclassified as carcinogenic to humans by the IARC (Assaf et al., 2019). Industrial processing of milk has very little effect on its AFM1 content. This mycotoxin is resistant to heat treatment of milk (sterilization, pasteurization) and other dairy product manufacturing processes (Iqbal et al., 2015 ; JEFCA 2018). In Côte d'Ivoire, several studies have reported contamination of foodstuffs intended for human and animal consumption by mycotoxins, particularly aflatoxin B1 (Diomandé et al., 2019 ; Wyers et al., 1991 ; Emanfo et al., 2013). The consumption of feed contaminated with aflatoxin B1 by lactating cows could affect the sanitary quality of the milk produced. Furthermore, milk imported into Côte d'Ivoire comes mainly from Europe and Asia, which are areas prone to aflatoxin production (Chatellier ; 2020). Milk consumed in Côte d'Ivoire, whether locally produced or imported, could be heavily contaminated with aflatoxin M1. However, very little scientific data exists on the level of contamination in milk and dairy products consumed nationwide. This study was initiated to contribute to knowledge about the sanitary quality of milk consumed. Its aim was to assess the occurrence of AFM1 in imported and locally produced milk sold in markets in Abidjan, Côte d'Ivoire.

2 MATERIALS AND METHODS

2.1 Study type and setting

This was a descriptive and analytical study conducted in the district of Abidjan, aimed at assessing the level of contamination in three types of milk sold in Côte d'Ivoire. The analyses were carried out at the Nutrition Laboratory of the National Institute of Public Health in Abidjan (INSP).

2.2 Chemicals

Aflatoxin M1 (AFM1) and immunoaffinity columns (SENSIColumn IAC Aflatoxin M1) were purchased from NOVAKITS (Nantes, France). All reagents used (acetic acid, acetonitrile, methanol, dipotassium hydrogen phosphate, potassium dihydrogen phosphate) were of analytical grade.

2.3 Sampling and data collection

A preliminary survey of households and milk sellers enabled two types of imported milk that are most commonly consumed to be selected for this study. These were powdered milk and liquid milk. A total of 60 samples, including 30 samples of liquid milk and 30 samples of powdered milk, were collected from points of sale (supermarkets, shops) located in four municipalities in the district of Abidjan (Anyama, Abobo, Yopougon, and Treichville). In addition, thirty samples of raw cow's milk were collected from traditional local producers in the outlying areas of the municipalities of Adjamé, Abobo, and Anyama (Table 1). A structured survey was conducted among these livestock farmers. The questionnaires focused on the origin of the dairy cows, the nature of their feed, and the distribution channel for this type of milk. The milk samples collected were transported to the laboratory for analysis.

Table 1: Sample sizes for different milk qualities.

Sample type	Number	Origin
Powdered milk	30	Imported
Liquid milk (semi-skimmed)	30	Imported
Raw cow's milk	30	Local production

2.4 Validation of the analytical method

The technique for measuring AFM1 in milk was carried out in accordance with the criteria set out in the validation guide published by the French Agency for Food, Environmental and Occupational Health and Safety (ANSES). In particular, linearity, repeatability, accuracy, detection limit, and quantification limit (ANSES, 2015).

2.4.1 Linearity

Linearity was evaluated for seven levels of aflatoxin M1 concentrations ranging from 10 to 200 ng/L (10; 25; 50; 100; 150; 200 ng/L) (n=5). The calibration curve corresponds to a linear regression estimated by the least squares method and is expressed by the coefficient of determination R^2.

2.4.2 Repeatability

This was studied at two concentration levels (n=5). AFM1 was studied at 100 ng/mL for the reference solution and at 146.86 ng/mL for the milk sample. Each solution was injected five times. The coefficient of variation (CV), which is the mathematical expression of repeatability, was calculated using the following formula.

$$CV(\%) = \frac{100\,\sigma_{n-1}}{\overline{X}}$$

CV : Coefficient of variation
σ_{n-1} : Standard deviation
$\overline{X}$: Average

2.4.3 Accuracy

Accuracy was studied using the spiking method. A known concentration of AFM1 was added to milk samples for the different assays. Accuracy was measured at three levels of AFM1 concentration: 50, 100, and 200 ng/mL (n=5). It represents the degree of agreement between the value obtained using the method and the reference value or the value conventionally considered to be the true value. The principle of accuracy is to calculate the recovery values as a percentage (%) between the quantities found and the quantities introduced.

2.4.4 Detection and quantification limits

The detection limits (DL) and quantification limits (QL) of the assay method were calculated using the standard deviation of the signal obtained (sb) during the analysis of 10 blanks (matrix without the analyte to be measured). These limits were calculated using the following formulas: DL = 3 x sb, QL = 10 x sb.

2.5 AFM1 measurement in milk

The various stages of measurement (sample preparation, extraction, purification, and quantification) of AFM1 in milk were carried out in accordance with ISO 14501 (2021).

2.6 Sample preparation

2.6.1 Semi-skimmed milk and raw cow's milk

The liquid milk samples (semi-skimmed and raw cow's milk) were centrifuged at 3000 × g for 15 min and then filtered through filter paper. A volume of 50 ml of the filtrate was collected for AFM1 research and analysis.

2.6.2 Powdered milk

A quantity of 10 g of powdered milk was taken and then 50 ml of distilled water preheated to 50°C was added in small quantities to the sample. The resulting solution was homogenized and then left to cool to 20°C in a 100 ml volumetric flask. Distilled water was added up to the mark on the flask. The resulting solution was then centrifuged at 3000 x g for 15 min, and a volume of 50 ml was taken.

2.6.3 Extraction and purification of AFM1

The extraction and purification of the mycotoxin was performed using the SPE (solid phase extraction) method with immunoaffinity columns (SENSIColumn IAC Aflatoxin M1). A volume of 50 mL of each milk sample was diluted with 5 mL of PBS buffer (50 mM) and loaded onto an immunoaffinity column connected to a vacuum system. The solution was passed through the immunoaffinity column at a constant flow rate of 2 mL/min to bind aflatoxin M1. The column was then washed with 5 ml of PBS (50 mM). Aflatoxin M1 was eluted from the column with 2 x 1 ml of methanol and the eluate was collected in a conical tube.

2.7 Chromatographic conditions

Aflatoxin M1 was measured in milk using an HPLC system (Shimadzu-USA Manufacturing Inc.) with a fluorescent detector. A reverse-phase column: Trentec Reprosil-Pur RP C18 120/ODS3 5 µm; 125 x 3.0 mm with a 2.1 mm ID C18 precolumn, was used at a temperature of 50°C. The excitation and emission wavelengths were 362 and 440 nm, respectively. Mobile phase A consisted of methanol/deionized water (85/15 v/v) and mobile phase B consisted of methanol/acetonitrile/deionized water (18/18/64 v/v/v). The injection volume was 100 µl. The elution gradient had a flow rate of 0.5 mL/min.

2.8 Estimation of aflatoxin B1 content in feed

The AFB1 content of cow feed was assessed based on the work of Price et al. (1985) using the following formula : AFB1 µg/kg = [AFM1 (ng/kg) × 100] / 1.6 × 1000.

2.9 Statistical analysis

The data were analyzed and calculated for all statistical values, and the mean and standard deviation of all variables were calculated using Microsoft Excel 2013 and the SPSS (Statistical Package for Social Sciences, IBM version 23) application.

3 RESULT

3.1 Result of the validation of the assay method

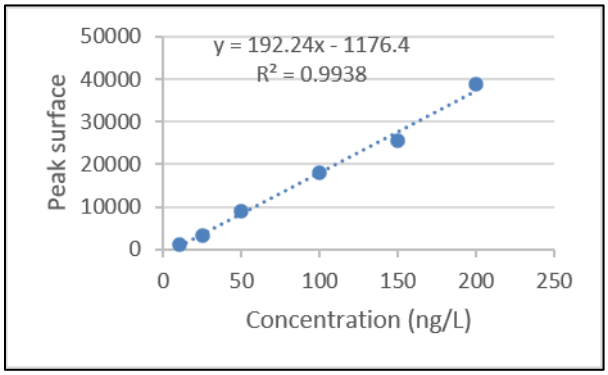


Figure 1: AFM1 calibration curve

The method used for the assay of AFM1 had a linearity range of 10 to 200 ng/L (Figure 1). The regression line equation was y = 192.24x + 1176.4. The coefficient of determination (R^2 = 0.9938) was very close to 1. A proportionality was established between the peak area and the concentration of AFM1 in the linearity range. The recovery rate of the method on the columns used indicated a value between 91 and 95 % with an average yield of 93.33 % (Table 2). The limit of quantification for aflatoxin M1 in milk was 5 ng/kg. The retention time was 21.5 minutes (Figure 2). The coefficient of variance (CV) was 0.96 % for the reference solution and 1.7 % for the milk sample. The parameters for the validation of the analytical method are summarized in Table 2.

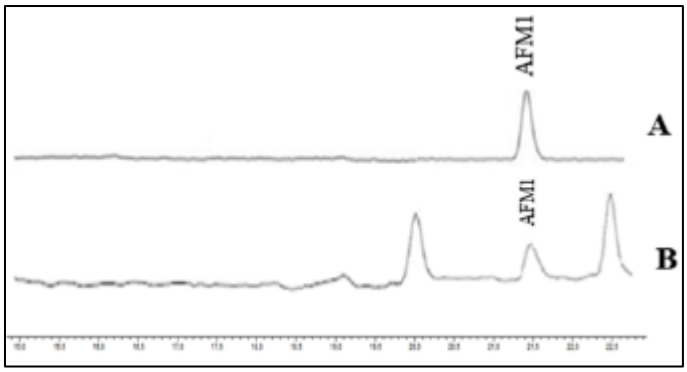


Figure 2: Chromatogram of aflatoxin M1: (A): aflatoxin M1 standard at 150 ng/kg; milk sample at 94 ng/kg (B).

Table 2: Performance of the analytical method on an affinity column for the assay of AFM1

Linearity		**Coefficient of variance (CV) (%)**		**Accuracy**				**Limit of quantification (ng/kg)**
Linear equation	Coefficient of determination	Reference solution	Sample	Initial concentration (ng/kg)	Concentration obtained after extraction (ng/kg)	Collection rate	Average yield	5
Y= 192,24x - 1176,4	R^2 = 0,9938	0, 96	1,7	25	23,5± 1,03	94	93, 33 ± 2,45	
				100	91± 2, 36	91		
				200	194± 4,56	95		

3.2 Aflatoxin M1 content in milk

All types of milk samples tested were contaminated with AFM1, with levels ranging from 11 to 163 ng/kg. The percentages of positive samples for each type of milk were 56.7 %, 73.3 %, and 86.7 % for semi-skimmed liquid milk, powdered milk, and raw cow's milk, respectively. The average concentrations of AFM1 in liquid, powdered, and raw cow's milk were 47±19 ng/kg, 67±35 ng/kg, and 121±45 ng/kg, respectively (Table 3). The proportions of liquid milk, powdered milk, and raw cow's milk contaminated above the maximum permissible level of 50 ng/kg set by the European Union were 16.7 %, 26.7%, and 36.7 %, respectively.

Table 3: Aflatoxin M1 content in milk samples

Type of milk	**Samples (N)**	**Positive samples (n)**	**Average concentration (ng/kg)**	**Interval (ng/kg)**	**Aflatoxin M1 > 50 ng/kg limite EU (%)**	***Maximum permissible content (ng/kg) (EU)**
Semi-skimmed milk	30	17 (56.4 %)	47±19	13 -76	5 (16.7 %)	50
Whole milk powder	30	22 (73.3 %)	67±35	11 -117	8 (26.7 %)	
Raw cow's milk	30	26 (86.7 %)	121 ± 45	21-163	11 (36.7 %)	

*Maximum permissible level set by the European Union (EU) 2023/915 for raw milk, heat-treated milk, and milk intended for the manufacture of milk-based products.

3.3 Estimation of aflatoxin B1 content in feed

The estimated AFB1 content in dairy cow feed was 2.67, 4.81, and 7.5 µg/kg in liquid milk, powdered milk, and raw cow's milk, respectively (Table 4). The feed of raw milk-producing cows has an AFM1 content above the regulatory limit of 5 µg/kg for dairy cows.

Table 4: Estimated value of aflatoxin B1 in dairy cow feed

Type of milk	Extrapolated AFB1 estimated value (µg/kg)	Interval (µg/kg)	* Regulatory threshold (µg/kg)
Semi-skimmed milk	2,67	0,81 - 4,75	5
Whole milk powder	4,81	0,68-8,58	
Raw cow's milk	7,5	1,31-13,31	

*Regulatory limit for AFB1 in dairy cow feed set by the European Union (EC) 2023/915 of April 25, 2023.

3.4 Dietary profile of dairy cows

Surveys conducted among traditional local milk producers reveal that the diet of dairy cows consisted mainly of cassava peelings (60 %), fodder (18 %), wheat bran (15 %), and corn bran (7 %) (Figure 3). These feeds are stored in the open air under unhygienic conditions (lack of maintenance of feeders).

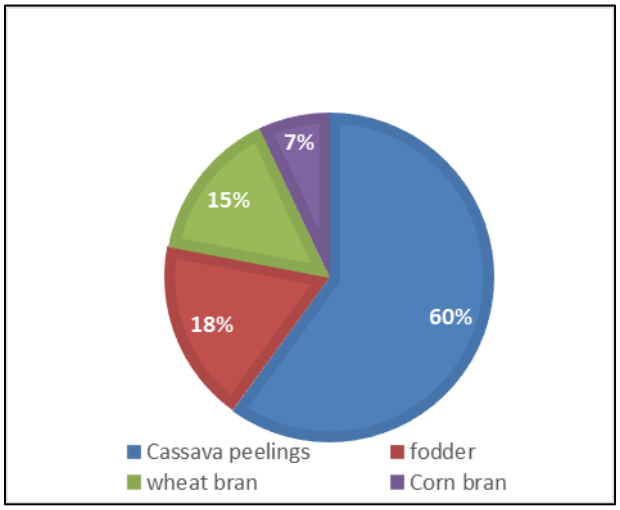


Figure 3: Dietary profile of dairy cows

4 DISCUSSION

This study was conducted on the occurrence of AFM1 in milk in Côte d'Ivoire. The analytical method using immunoaffinity columns was validated to ensure the reliability of the results. AFM1 was extracted and purified on immunoaffinity columns (SENSIColumn IAC Aflatoxin M1) and then quantified using an HPLC system coupled with a fluorescence detector. The coefficient of determination for AFM1 was R^2 = 0.9938, close to 1, reflecting proportionality between the chromatographic peak area and the concentration of AFM1 in the linearity ranges. The analytical method has satisfactory repeatability, as the coefficients of variation (CV) of 0.96 % for the reference solution and 1.7 % for the milk sample comply with current standards. In fact, the coefficients of variation were less than 2 % for the reference solution and 5 % for milk, values generally accepted in quantitative analysis for reference solutions and samples (Chaminade et al., 1995). The extraction of analytes using the spiked sample method yielded average recoveries of 93.3 %. The extraction of analytes on columns (SENSIColumn IAC Aflatoxin M1) was a good method of purifying samples, as it increased the sensitivity of the method while ensuring that the peaks were clearly separated. The limit of quantification for AFM1 (5 ng/kg) is close to those reported in the literature, which range from 1 to 25 ng/kg (Shundo et al., 2006 ; Malissiova et al., 2024). These limits justify the sensitivity of our study method. The raw cow's milk studied is produced locally and comes from traditional farms located on the outskirts of the Abidjan district. The other two types of milk (semi-skimmed liquid milk and powdered milk) are produced industrially from imported milk. All three types of milk studied were contaminated with AFM1, with levels ranging from 11 to 163 ng/kg. AFB1, which is derived from AFM1, is mainly produced by various strains of molds of the genus Aspergillus : *Aspergillus parasiticus* and *Aspergillus flavus* (Shahbazi, 2017). These molds grow in foodstuffs in hot Mediterranean and tropical regions,

particularly in sub-Saharan Africa and Asia (Malissiova et al., 2024). Food products intended for human and animal consumption in these different regions are therefore heavily contaminated with aflatoxins produced by these molds. The presence of AFM1 in milk suggests that cows have been exposed to AFB1 through their feed. Imported milk comes from Europe and Asia, which are areas conducive to the development of molds that produce aflatoxin B1. The secretion of AFM1 in milk varies depending on a number of factors, including the animal species, the season and time of milking, the level of AFB1 intake, and the volume of milk produced by the mammal (Quinn et al., 2018; Britzi et al., 2013; Jalili et al., 2015). The proportions of contaminated liquid milk, powdered milk, and raw cow's milk exceeding the maximum permissible level of 50 ng/kg set by the European Union and the Codex Alimentarius (Sharaf, 2016 ; European Commission, 2023) were 16.7 %, 26.7 %, and 36.7 %, respectively. Nearly 80 % of the milk consumed in Côte d'Ivoire is imported from Europe and New Zealand (Chatellier ; 2020). Several studies conducted in the sub-region, particularly in Mali and Senegal, on dairy products from these parts of the world have also shown high levels of AFM1 contamination ranging from 30 to 100 ng/kg (Traoré et al., 2023). Furthermore, several studies reveal that the Mediterranean regions where this milk comes from have a high risk of contamination by AFB1 and, consequently, AFM1 (Malissiova et al., 2024). The proportions of samples that tested positive for AFM1 for semi-skimmed milk, powdered milk, and raw cow's milk were 56.4 %, 73.3 %, and 86.7 %, respectively. This high occurrence of AFM1 in milk reflects high contamination of the cows' feed with aflatoxin B1. In lactating cows, approximately 1 to 6 % of the AFB1 ingested through feed is converted to AFM1 by cytochrome P450 and secreted into milk (Price et al., 1985 ; Iqbal., 2015 ; Jaiswal., 2018). Estimates of contamination in dairy cow feed indicate high levels of AFB1, ranging from 2.7 to 7.5 µg/kg. These results suggest that many cows producing raw milk are fed a diet with an aflatoxin B1 content above the regulatory limit for animals, set at 5 µg/kg (European Commission, 2023). Surveys conducted among traditional local milk producers indicate that the feed given to dairy cows consists mainly of cassava peelings, fodder, wheat bran, and corn. These products are stored in damp, unhygienic conditions. The nature of these substrates and the storage conditions (humidity and temperature) used by farmers promote the development and proliferation of aflatoxin-producing molds.

5 CONCLUSION

This study reveals a high occurrence of aflatoxin M1 in certain imported and locally produced milk. AFM1 contamination of milk poses a serious health problem due to its high toxicity and carcinogenicity in humans. Strengthening control measures and rigorously enforcing regulations on imported and locally produced milk and dairy products is essential to ensure food safety for consumers.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

Acknowledgments

The authors thank the Nutrition Laboratory at the National Institute of Public Health (INSP) for its contribution to this study.

Disclosure of conflict of interest

The authors declare that no conflicts of interest exist.

REFERENCES

[1] ANSES (French Agency for Food, Environmental and Occupational Health & Safety), 2015. Guide to the Validation of Analytical Methods. 67 pp. https://www.anses.fr/en/system/files/ANSES_GuideValidation.pdf

[2] Alahlah N, El Maadoudi M, Bouchriti N, Triqui. R, Bougtaib H, 2020. Aflatoxin M1 in UHT and powder milk marketed in the northern area of Morocco. Food Control, 114 :107-262.

[3] Assaf JC, Nahle S, Chokr A, Louka N, Atoui A, Khoury AE, 2019. Assorted Methods for Decontamination of Aflatoxin M1 in Milk Using Microbial Adsorbents. Toxins, *11*(6), 304 ; https://doi.org/10.3390/toxins11060304

[4] Awaisheh SS, Rahahleh RJ, Algroom RM, Al-Bakheit AAA, Al-Khaza'leh JFM, Al-Dababseh B A, 2019. Contamination level and exposure assessment to Aflatoxin M1 in Jordanian infant milk formulas. Italian journal of food safety., 8(3) :127-130.

[5] Barkai-Golan R, Paster N, 2008. Mouldy fruits and vegetables as a source of mycotoxins: part 1. World Mycotoxin J. 2008 ; 1 :147–159. https://doi.org/10.3920/WMJ2008.x018

[6] Barreto F, Jank L, Castilhos T, Rau RB, Tomaszewski CA, Cristina Ribeiro C, Hillesheim DR, 2019. Chapter 13 - Chemical Residues and Mycotoxins in Raw Milk. Raw Milk, 273-293. https://doi.org/10.1016/B978-0-12-810530-6.00013-4.

[7] Britzi, M, Friedman S, Miron J, Solomon R, Cuneah O, Shimshoni AJ, Soback S, Ashkenazi R, Armer S, Shlosberg A, 2013. Carry-Over of Aflatoxin M1 in Cows in Mid- and Late-Lactation. *Toxins*, *5* : 173–183.

[8] Campagnollo FB, Ganev KC, Khaneghah AM, Portela JB, Cruz AG, Granato D, Sant'Ana A S, 2016. The occurrence and effect of unit operations for dairy products processing on the fate of aflatoxin M1: A review. Food Control 68 :310-329.

[9] Chatellier V, 2020. West Africa's Dependence on Dairy Imports. *INRAE Prod. Anim.*, *33*(2), 125–140. https://doi.org/10.20870/productions-animales.2020.33.2.4027.

[10] haminade P, Ferau DS, Baillet A, Ferrier D, 1995. Validation of a chromatographic analysis method by CLHP : ruggedness test and validation of the technique. *STP pharma pratiques.* 5 (1) :17-35.

[11] Dieme E, Fall R, Sarr I, Sarr F, Traore D, Seydi M, 2017. African crops contamination by aflatoxin: review of existing methods of Control. Int. J. Biol. Chem. Sci. 10(5): 2285-2299. https://doi.org/10.4314/ijbcs.v10i5.27.

[12] Diomande AF, Kouakou KJM, Diemeleou CA, Traore KS, Dembele A, 2019. Food exposure to carcinogenic mycotoxins in the county of Séguéla (northwestern Ivory Coast): case of aflatoxin B1. Int. J. Biol. Chem. Sci. 13(2): 937-949

[13] Dovonou EC, 2018. Status of the Dairy Sectors in the 15 ECOWAS Countries, Mauritania, and Chad: Appendix 4: Côte d'Ivoire Fact Sheet, CIRAD. 29 pp. Document accessed on November 6, 2025, on the website : https://www.inter-reseaux.org/wp-content/uploads/RapportCoteIvoireOffensiveLait.pdf

[14] Emanfo ASA, Sekou D, Fantodji A, 2013. Fungal contamination of fodder consumed by the grasscutter (Thryonomys Swinderianus) Breeding in Suburban areas of Abidjan (Côte D'Ivoire). Agronomie Africaine 25 (1) : 53 – 60.

[15] European Commission, 2023. Regulation (EC) 2023/915 of 25 April 2023. Off. J. Eur. Union L 119/103 : 103–157. Available online: https://eur-lex.europa.eu/eli/reg/2023/915/oj.

[16] FAO, European Union, and CIRAD. 2022. Food Systems Profile – Côte d'Ivoire. Driving the Sustainable and Inclusive Transformation of Our Food Systems. Rome, Brussels, and Montpellier, France. 52p. https://doi.org/10.4060/cc1267fr

[17] Houissa H, 2020. Mycotoxins in Millet: Occurrence and Fungal Flora. Mycology. University of Montpellier; University of Tunis El-Manar. Faculty of Sciences, Tunis (Tunisia), French. Hall open science 259p. https://theses.hal.science/tel-03210236v1/file/2020_Houissa_archivage.pdf.

[18] Iqbal SZ, Jinap S, Pirouz AA, Ahmad Faizal AR, 2015. Aflatoxin M1 in milk and dairy products, occurrence and recent challenges : A review. Trends in Food Science & Technology 46 : 110-119. http://dx.doi.org/10.1016/j.tifs.2015.08.005

[19] ISO 14501—FIL 171, 2021. Milk and milk powder—Determination of aflatoxin M1 content—Purification by immunoaffinity chromatography and determination by high-performance liquid chromatography. Third edition, p. 11.

[20] Jaiswal P, Jha SN, Kaur J, Borah A, Ramya H G, 2018. Detection of aflatoxin M1 in milk using spectroscopy and multivariate analyses. Food chemistry 238 :209-214.

[21] JEFCA. 2018. Safety evaluation of certain contaminants in food: prepared by the eighty-third meeting of the Joint FAO/WHO Expert Committee on Food Additives (JECFA). Geneva: World Health Organization and Food and Agriculture Organization of the United Nations; 2018 (WHO Food Additives Series, No. 74; FAO JECFA Monographs 19 bis) Jolly, P.

[22] Malissiova E, Tsinopoulou G, Gerovasileiou ES, Meleti E, Soultani G, Koureas M, Maisoglou I, Manouras A, 2024. A 20-Year Data Review on the Occurrence of Aflatoxin M1 in Milk and Dairy Products in Mediterranean Countries—Current Situation and Exposure Risks. Dairy, 5 : 491–514. https://doi.org/10.3390/dairy5030038

[23] Marchese S, Polo A, Ariano A, Velotto S, Costantini S,Severino L, 2018. Aflatoxin B1 and M1: Biological Properties and Their Involvement in Cancer Development. Toxins, 10, 214; doi:10. /toxins10060214

[24] Price RL, Paulson H, Lough G, Ginng C, Kurtz G, 1985. Aflatoxin conversion by dairy cattle consuming naturally contaminated whole cottonseed. J Food Protect 48:11-5. https://doi.org/10.4315/0362-028X-48.1.11.

[25] Quinn G, Gary PJ, Damiano C, Teehan G,2018. Treatment of Resistant Hypertension: An Update in Device Therapy. In *ERRATUM*; InTechOpen: London, UK, 2018; pp. 1–11.

[26] Safwan M, 2020. Evaluation and Assessment of Aflatoxin M1 in Milk and Milk Products in Yemen Using High-Performance Liquid Chromatography. Journal of Food Quality Volume 2020, Article ID 8839060, 8 pages https://doi.org/10.1155/2020/8839060

[27] Shahbazi Y, 2017. Aflatoxin M1 Contamination in Milk and Dairy Products: Implications on Human Health. In Nutrients in Dairy and their Implications on Health and Disease. Elsevier. pp. 237-250.

[28] Sharaf SO, 2016. Aflatoxin M1 levels in raw milk, pasteurised milk and infant formula. Ital J Food Saf., 3 ;5(3):5788. https://doi.org/10.4081/ijfs.2016.5788

[29] Shundo L, Sabino M, 2006. aflatoxin m1 in milk by immunoaffinity column cleanup with tlc/hplc determination. Brazilian Journal of Microbiology, 37 :164-167.

[30] Tondel, F., 2019. Regional Dynamics of Livestock Value Chains in West Africa: A Case Study Focusing on Côte d'Ivoire in the Central Trade Basin. Political Economy Dynamics of Regional Organizations in Africa (PEDRO), Discussion Paper No. 241. https://ecdpm.org/application/files/6016/5546/8697/DP-241-Dynamiques-regionales-des-filiers-delevage-en-Afrique-de-lOuest.pdf

[31] Torres AM, Barros GG, Palacios SA, Chulze SN, Battilani P, 2014. A Review of Pre- and Post-Harvest Management of Peanuts to Minimize Aflatoxin Contamination. Food Res. Int., 62:11–19. https://doi.org/10.1016/j.foodres.2014.02.023.

[32] Traoré A, Touré H, Barry A, Diarra D, 2023. Contamination of milk imported into Mali by aflatoxin M. international journal of progressive sciences and technologies, 38 (2) :452-464.

[33] Wyers M, Mobio M, Schricke E, N'guetta A, 1991. Investigation of lesions caused by aflatoxin B1 poisoning in three industrial chicken farms in Côte d'Ivoire. Revue Elev. Méd. vét. Pays trop, 44 (1): 15–21