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# EVALUATION OF AFLATOXIN M1 CONTAMINATION OF RAW MILK AND ITS PRODUCTS IN KATAKWI TOWN COUNCIL KATAKWI DISTRICT

**BY AKOL PEACE**

**BU/UP/2021/2655**

**A DESSERTATION REPORT TO BE SUBMITTED TO THE FACULTY OF AGRICULTURE AND ANIMAL SCIENCES AS A REQUIREMENT FOR PARTIAL FULFILLMENT FOR AWARD OF A BACHELOR DEGREE OF ANIMAL PRODUCTION AND MANAGEMENT OF BUSITEMA UNIVERSITY**

**OCTOBER 2024**

## DECLARATION

I, **AKOL PEACE,** hereby declare that this research report was organized by me under the guidance of my supervisor and it has never been submitted before for any award.

**NAME:** ....AKOL PEACE.....

**SIGN:**.....**DATE:**...11/11/2024.....

## APPROVAL

This research report titled "**EVALUATION OF AFLATOXIN M1 CONTAMINATION OF RAW MILK AND ITS PRODUCTS IN KATAKWI TOWN COUNCIL KATAKWI DISTRICT**

"*by* ***AKOL PEACE*** was done under supervision and is now ready for submission.

Signature: ..... Date: 11/11/2024

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## DEDICATION

I dedicate this research to my beloved Husband John Robert Ocen whose unwavering support has been the foundation of my journey. To my mother Ms. Atiang Florence for instilling in me the value of hard work.

## ACKNOWLEDGEMENT

I extend my deepest gratitude to my supervisor Mr. Muyinda Robert for his valuable insights through the research process. Special thanks to my colleagues and friends for their support.

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## LIST OF ACRONYMS

**AFM1** - Aflatoxin M1

**UNBS** - Uganda National Bureau of Standards

**ANOVA** - Analysis of Variance

**ppb** - Parts per billion

**HCC** - Hepatocellular Carcinoma

**MCL** - Maximum Contaminant Level

**WHO** - World Health Organization

**FAO** - Food and Agriculture Organization

**USDA** - United States Department of Agriculture

**FDA** - Food and Drug Administration

**NDA** - National Dairy Authority

**GMOs** - Genetically Modified Organisms

**PCR** - Polymerase Chain Reaction

**ELISA** - Enzyme-Linked Immunosorbent Assay

**TDI** - Tolerable Daily Intake

**PDA** - Public Display of Affection (less relevant but could be mistaken for this acronym)

**ICMSF** - International Commission on Microbiological Specifications for Foods

**Nutr. Rev.** - Nutrition Reviews (often cited for health-related effects)

**RDA** - Recommended Dietary Allowance

## ABSTRACT

This study aimed to evaluate the contamination levels of Aflatoxin M1 (AFM1) in milk and its products and to compare AFM1 contamination levels across different wards within Katakwi Town council. AFM1, a potent toxin found in milk and dairy products, poses serious health risks including liver cancer and immunotoxicity. A total of 200 samples, comprising raw cow milk, yogurt, ghee, and bongo, were collected from various wards within Katakwi Town Council.

A competitive Enzyme linked Immunosorbent Assay (ELISA version V1.2 catalogue-No-E-TO-EOO7 96T/96T*3) was employed to determine the concentration of AFM1 in these samples. A survey was also conducted to assess public awareness of AFM1 contamination and consumption habits. All data was analysed statistically using IBM SPSS Statistics version 23 (Chicago, 1L, USA). Milk from Eastern ward had the highest contamination at 5.60 ppb, while ghee from the same ward showed 4.60 ppb. The Northern wards milk and bongo samples had concentrations of 2.15 ppb and 1.71 ppb, respectively. The survey results indicated a moderate level of public awareness regarding AFM1 contamination, with a mean rating of 3.22 on a 4-point scale.

Two-Way ANOVA indicated that the sum of squares for region was 75.32, yielding an F-value of 18.52 and a p-value of 0.0002. This strong statistical significance suggests that AFM1 contamination varies considerably across different wards. The findings revealed that AFM1 contamination levels in milk and its products significantly exceeded the permissible limits (0.005) set by the Uganda National Bureau of Standards (UNBS) and the World Health Organization (WHO).

The study's results are consistent with previous findings that highlighted the pervasive nature of AFM1 contamination in dairy products, particularly in areas with inadequate storage and poor agricultural practices. This aligns with studies by Zinedine et al. (2021) and Routledge et al. (2016). Effective monitoring, public education, and stringent regulatory measures are essential to mitigate the risk of exposure to AFM1contamination. Regular monitoring and testing programs should be implemented, alongside public awareness campaigns and stricter regulations. Further research is needed to explore effective methods for reducing AFM1 contamination in dairy products.

# CHAPTER ONE

## 1.0 INTRODUCTION

### 1.1 Background

Milk has been considered as a necessary macro- and micro-nutrients for the growth, development and maintenance of human health and has been ranked as the most important source of nutrients for human body particularly to children and infants. In Uganda according to the government, Dairy Development Authority in October 2018 annual national milk output stood at 2.2 billion litres, up from 1.8 billion litres annually, as of July 2012. As of 2017, per capita milk consumption in Uganda stood at 62 litres, up from 25 litres in 1986. . Unfortunately Uganda loses US$ 577 million annually as a result of 3700 aflatoxin-induced liver cancer cases. In addition, the aflatoxin-related illnesses cost the government of Uganda an extra US dollars 910,000 on health services. The relationship between livestock feed with health and safety of milk has been very close and might be the principle way for the entrance of Aflatoxins into the human body. Aflatoxin $M_1$ ($AFM_1$) is one of the principle hydroxylated derivative and metabolites of $AFB_1$ that has been frequently found in milk (Galvano et al.2021). $AFM_1$ is produced through cytochrome P450-associated enzymes in the liver, when animals or human consume the contaminated diet with $AFB_1$. These metabolites are subsequently released in the urine and milk of both human and lactating animals (Prandini et al.2009). The amount of $AFM_1$ which was found in milk depends on several factors such as animal breed, lactation period, mammary infections, and directly proportional with $AFB_1$ in feed consumed by the animals (Sarimehmetoglu et al.2004). ). It has been shown that AFM1 content of raw milk was almost resistant to the common processes such as pasteurization (Iha, Barbosa, Okada, & Trucksess, 2013). Therefore, this toxin can be identified in various dairy products made from contaminated milk (Bahrami, Shahbazi, & Nikousefat, 2016).

Aflatoxins (AFs) are a group of toxic and carcinogenic secondary fungal metabolites, which are produced by toxicogenic strains of various *Aspergillus* species such as *A. flavus, A. parasiticus*, and *Aspergillus nominus* (Kumar et al., 2017) and these mycotoxins are found anywhere in the environment AFs are assigned as a hepatotoxic, mutagenic, teratogenic, immunosuppressive, and neoplastic (Lereau et al. 2012). AFs have been implicated both acutely and chronically toxic effects for animals and humans and can produce dangerous diseases such as liver cancer, chronic hepatitis, tumor induction, jaundice, and cirrhosis

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