BUSITEMA UNIVERSITY
Pursuing Excellence

P.O. Box 236, Tororo, Uganda
Gen: +256 - 45 444 8838
Fax: +256 - 45 4436517
Email: info@adm.busitema.ac.ug

www.busitema.ac.ug

DETERMINATION OF LEVELS OF SOME HEAVY METALS (Pb, Cr AND Cd) IN RAW MILK PRODUCED WITHIN KAMDINI- OYAM DISTRICT, UGANDA

BY

OJUKA FELIX CHRIS

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Email - felixojuka@gmail.com

A DESERTATION SUBMITTED TO THE FACULTY OF AGRICULTURE AND ANIMAL SCIENCES IN PARTIAL FULFILLMENT OF REQUIREMENTS FOR THE AWARD OF BACHELOR DEGREE OF ANIMAL PRODUCTION AND MANAGEMENT OF BUSITEMA UNIVERSITY

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DECLARATION

I Ojuka Felix Chris hereby declare that this research report contains a true record of the activities that I carried out, and has never been presented by anybody for any award.

Signature……..

Date…….

APPROVAL

This is to certify that Ojuka Felix Chris was under my supervision during the preparation of this research report. This is a true record of the work that he was involved in under my supervision and is now ready for submission to the Board of examiners of Busitema Universitywith my due approval.

Supervisor,

DrHellen Kisakye

Signature……

Date……

DEDICATION

I dedicate this piece of work to my wifeMrsSemmyOjuka, my children Raphael Olok, Basil Enon, Gerard Omodo andPrisca Bridget Alobo. And finally to all our family members.

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Finally, I want to say may God reward all of you abundantly – AMEN.

ABSTRACT

Raw bovine milk is considered as one of the food sources that contaminated with heavy metals, because the cows graze on the grass grown in lands which somehow come in contact with the untreated effluent of industries. Heavy metal contamination is a serious threat because of their toxicity, bio-magnification and bioaccumulation in food chain. The deficiency of elements leads to impairment of vital biological process but when they are present in excess, they become toxic. The study sheds light on levels of selected heavy metals in raw bovine milk produced in Kamdini- Oyam district.In total 40 samples were taken for study,the mean concentration levels of the metals were 0.17±0.082327, 6.84±2.034808 and 0.13±0.048305 (ppm) for Lead, Chromium and Cadmium, respectively for samples taken from Pukica Parish. The mean concentration levels of the metals were 0.15±0.070711, 6.55±1.709613 and 0.12±0.042164 (ppm) for Lead, Chromium and Cadmium, respectively for samples taken from Zambia Parish. The mean concentration levels of the metals were 0.16±0.069921, 6.83±1.742954 and 0.15±0.108012 (ppm) for Lead, Chromium and Cadmium respectively for samples taken from Ocini Parish. The mean concentration levels of the metals were 0.28±0.175119, 8.34±2.915933 and 0.19±0.128668 (ppm) for Lead, Chromium and Cadmium respectively for samples taken from Kamdini Parish.The Target Hazard Quotient (THQ) of all heavy metals analysed (Pb, Cr and Cd) in milk samples was found to be less than 1. Hence it would be inferred that it's safe in terms of heavy metal food poisoning for human being to drink the milk from this area.

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LIST OF ABBREVIATIONS

AAS – Atomic Absorption Spectrometer.

Ag – Silver.

As – Arsenic.

BU – Under private.

Cd – Cadmium.

Co – Cobolt.

Cr - Chromium.

DAO – District Agricultural Officer.

DNA – Deoxyribonucleic acid.

DPMO – District Production and Marketing officer.

Dr. – Doctor.

DVO – District Veterinay Officer.

EDI – Estimated daily intake.

FAAS – Flame Atomic Absorption Spectrometry.

FAO – Food and Agricultural Organisation.

Fe – Iron.

Hg – Mercury.

Mg – Magnesium.

Mr. – Mister.

Pb – Lead.

ppm – parts per million.

RDA – Recommended dietary allowance.

RfD – Reference Oral Dose.

RNA – Ribonucleic acid.

SD – Standard deviation.

THQ – Target Health(Hazard) Quotient.

WHO – World Health Organisation.

UIRI – Uganda Industrial Research Institute.

UP – Under Private.

US EPA – United States Environmental Protection Agency.

Zn – Zinc.

CHAPTER ONE: INTRODUCTION

1.1 Background

Milk is a nutrient rich, white liquid food produced by mammary glands of mammals(Ranathunga *et al*, 2017). As an agricultural product, is extracted from farm animals during or soon after pregnancy. Milk and its products are very common in our food list due to their nutrient value, since it is a source of vitamins and lot of mineral constituents which are necessary for proper development and functioning of different tissues and organs(Farid, *at el*, 2004). However, chemical hazards and contaminants which are risk factors for dairy products can as well be in content milk and dairy products(Meshref, *et al*, 2014).

The nutritional components in milk are energy, water, carbohydrate, fat, protein, milk flavor, vitamins, minerals and minor biological proteins and enzymes. Cows are still considered most important among species in milk production with a contribution of 580.5 million kg (83.3%) of 696.6 million kgglobally according to FAO 2010 (Barłowska, *et al*, 2011) Milk is also a good source of calcium, phosphorus, potassium, vitamin D, riboflavin, vitamin A, vitamin B-12 and niacin and a good source of protein(Rao, *et al*, 2017). Despite the essential benefits of consuming milk, the contamination of milk from moderate agricultural practices, industrial pollutants in the environment, animal feeds and use of sewage sludge in agriculture is increasing and therefore requires urgent attention because of the risk this contamination poses especially to the health of the consumers.

Contamination of milk globally with unwanted substance through animal feeds, heavy metals, mycotoxins, diotoxins and similar pollutants has gained great concern to public health due to their toxic effects on humans and animals(Jigam, *et al*, 2011). Particular interest has been put on metals because of their ability to bioaccumulate(Pilarczyk, *et al*, 2013). Many reports have mirrored the presence of heavy metals in milk and other food products(Belete, *et al*, 2014). The interest in these elements is increasing due to the available reports of relationships between heavy metals status in food and drinking water and the prevalent oxidative diseases in living beings. Lead, Cadmium, Chromium, Nickel, Arsenic and Mercury are the most common toxic metals of concern according to reports (Naithani, *et al*, 2010).

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