UNIVERSITI PUTRA MALAYSIA

OCCURRENCE OF AFLATOXIN M1 IN URINE SAMPLES, MILK AND DAIRY PRODUCTS AND THEIR ASSOCIATED FACTORS AMONG RESIDENTS IN TERENGGANU, MALAYSIA

FARAH NADIRA BINTI AHMAD

FPSK(m) 2016 54

OCCURRENCE OF AFLATOXIN M_1 IN URINE SAMPLES, MILK AND DAIRY PRODUCTS AND THEIR ASSOCIATED FACTORS AMONG RESIDENTS IN TERENGGANU, MALAYSIA

By

FARAH NADIRA BINTI AHMAD

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirements for the Degree of Master of Science

May 2016

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in Fulfillment of the requirement for the degree of Master of Science

OCCURRENCE OF AFLATOXIN M_1 IN URINE SAMPLES, MILK AND DAIRY PRODUCTS AND THEIR ASSOCIATED FACTORS AMONG RESIDENTS IN TERENGGANU, MALAYSIA

By

FARAH NADIRA BINTI AHMAD

May 2016

Chairman : Rosita Binti Jamaluddin, PhD
Faculty : Medical and Health Sciences

Nowadays, in conjunction with dramatic growth of population, food safety matter is of concern. The exposure of fungi producing toxin named mycotoxins is one example of food contamination. Aflatoxin M_1 (AFM_1) is a major metabolite of aflatoxin B_1 (AFB_1) which is one of many naturally occurring mycotoxins. This cross-sectional comparative population (n=206) based study was comprised of two parts. The first part was to study the associations between socio-demographic, socio-economic statuses, the consumption of milk and dairy products and the level of awareness, knowledge, attitude and practice on aflatoxin with the occurrence of AFM_1 in urine sample among residents in Terengganu. The second part was to screen the occurrence of AFM_1 in commonly consumed milk and dairy products and to determine the relationship between the ingestion of AFM_1 through milk and dairy products with the level of urinary AFM_1. A set of questionnaire and a urine container were provided to each subject. Data collection was carried out from August 2013 to December 2013. The selection of subject and collection of milk products were based on systematic and purposive sampling respectively. The competitive enzyme-linked immunosorbent assay (ELISA) method was used to determine the level of AFM_1 in the samples of urine and milk products. Data was analyzed by using SPSS Software version 22.0

Bivariate analyses for the first part observed that urban and female subject were more aware, older and female subjects were more knowledgeable, urban and non-employed subjects had more attitude, rural, high educated, non-employed and subjects received monthly income RM1500 and above were practiced more toward aflatoxin matter. Besides, urban, high educated subjects and subjects with high knowledge and attitude tend to consume high amount of milk and dairy products. In the other hand, subjects below 30 years old and married subjects were observed to be more at risk to be exposed with AFM_1. In term of AFM_1 level, subjects below 30 years old, Chinese and non-employed subjects were exposed with higher level of AFM_1. This study also found significant associations between milk and dairy

products intake and the occurrence of urinary AFM_1. For the second part of the study, AFM_1 was detected in 39.6% of milk and dairy products tested. The level of contamination ranged from 0.9 to 119.1 ng/L. It was observable that 4 samples were above the European Commission limit and all of them were still below the Malaysian Food Regulation 1985 limit. All in all, both urban and rural subjects in Terengganu were slightly exposed with AFM_1 whereas for milk and dairy products commonly consumed by the residents in Terengganu, the exposure of AFM_1 was moderate. This study provided a pioneering data on the occurrence of AFM_1 in milk and dairy products in Malaysia.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Master Sains

KEJADIAN AFLATOKSIN M_1 DALAM SAMPEL AIR KENCING, SUSU DAN PRODUK TENUSU SERTA FAKTOR-FAKTOR MEMPENGARUHINYA DALAM KALANGAN PENDUDUK DI TERENGGANU, MALAYSIA

Oleh

FARAH NADIRA BINTI AHMAD

Mei 2016

Pengerusi : Rosita Binti Jamaluddin, PhD
Fakulti : Perubatan dan Sains Kesihatan

Pada masa kini, sejajar dengan pertumbuhan pesat populasi manusia, keselamatan produk makanan semakin membimbangkan. Pertumbuhan kulat yang menghasilkan toksin yang dipanggil mikotoksin adalah salah satu contoh pencemaran makanan. Aflatoksin M_1 (AFM_1) adalah metabolit utama aflatoksin B_1 (AFB_1) yang mana ia adalah salah satu daripada mikotoksin yang terhasil secara semualajadi. Kajian populasi komparatif rentas (n=206) ini terbahagi kepada dua bahagian. Bahagian pertama adalah untuk mengkaji hubungan antara sosio-demografi, sosio-ekonomi, pengambilan susu dan produk tenusu serta tahap kesedaran, pengetahuan, sikap dan amalan terhadap aflatoksin dengan kejadian AFM_1 dalam sampel air kencing dalam kalangan penduduk di Terengganu. Bahagian kedua adalah untuk menyiasat kejadian AFM_1 dalam susu dan produk tenusu yang kebiasaannya diambil oleh subjek serta menentukan hubungan antara pengambilan AFM_1 melalui susu dan produk tenusu dengan tahap AFM_1 dalam sampel air kencing. Satu set soalan dan satu bekas pengumpulan sampel air kencing diedarkan kepada setiap subjek. Pengumpulan data dijalankan sepanjang Ogos 2013 sehingga Disember 2013. Pemilihan subjek dan sampel susu masing-masing adalah berdasarkan persampelan sistematik dan persampelan bertujuan. Kompetitif *enzyme-linked immunosorbent assay* (ELISA) digunakan untuk mengesan tahap AFM_1 dalam sampel air kencing dan produk tenusu. Data dianalisis dengan menggunakan perisian SPSS versi 22.0.

Analisis bivariat bagi bahagian pertama mendapati subjek wanita dan subjek bandar lebih tinggi tahap kesedaran mereka, subjek lebih tua dan wanita lebih berpegetahuan, subjek bandar dan subjek yang tidak bekerja lebih menunjukkan sikap yang baik serta subjek luar bandar, subjek berpendidikan tinggi, tidak bekerja dan menerima pendapatan bulan sebanyak RM1500 dan ke atas adalah lebih tinggi amalan mengenai aflatoksin. Selain itu, subjek bandar, subjek berpendidikan tinggi, subjek yang lebih berpengetahuan dan menunjukkan sikap yang baik terhadap isu aflatoksin adalah lebih cenderung untuk mengambil susu dan produk tenusu dalam kuantiti yang tinggi. Selain daripada itu, subjek yang berumur 30 tahun dan ke

bawah dan subjek yang telah berkahwin didapati lebih berisiko terdedah dengan AFM_1. Bagi tahap pencemaran AFM_1 pula, subjek berumur bawah 30 tahun, berbangsa Cina dan tidak bekerja lebih tinggi tahap pendedahan terhadap AFM_1. Kajian ini turut mendapati bahawa pengambilan susu dan produk tenusu adalah berkait secara signifikan dengan terjadinya AFM_1 dalam sampel air kencing. Untuk bahagian kedua kajian, AFM_1 dikesan di dalam 39.6% sampel susu dan produk tenusu. Tahap pencermaran berjulat daripada 0.9 hingga 119.1 ng/L. Kajian turut mendapati 4 sampel melebihi had yang ditetapkan oleh *European Commission* dan semua sampel masih tidak melebihi had yang ditetapkan oleh Peraturan Makanan Malaysia 1985. Secara keseluruhannya, subjek bandar dan luar bandar di Terengganu terdedah dengan AFM_1 dalam kadar yang rendah manakala susu dan produk tenusu yang kebiasaanya diambil oleh subjek di Terengganu terdedah dalam kadar yang sederhana. Kajian ini menyediakan maklumat perintis bagi kejadian AFM_1 dalam susu dan produk tenusu di Malaysia.

.

ACKNOWLEDGEMENTS

Upon completion of this thesis, I would like to express my gratitude to ALLAH SWT because has given me opportunity to complete my research successfully likewise finish up my thesis. First and foremost, I would like to offer my sincerest gratitude to my beloved supervisor, Associate Prof. Dr. Rosita Binti Jamaluddin, who supported me throughout my whole journey with her patience and knowledge. I attribute my master degree to her encouragement and efforts.

Throughout the whole study, I have been aided in conducting the experiment and proposing the idea by my co-supervisor Associate Prof. Dr. Norhaizan Binti Mohd Esa and Dr. Mohd Redzwan Bin Sabran, enthusiastic academicians who kept me in diligent manner as a researcher to be. Moreover, without any doubt I also want to thank to my colleagues who are under the same supervision.

Last but not least, a warmth appreciation to my beloved parents (Ahmad Ngah & Nur Nadia Lim Abdullah), eldest brother (Mohd Qayyum), second younger brother (Mohamad Qayyim) and youngest brother (Muhammad Qawim) for their efforts in consoling me through thin or thick through up and down and through my best and my worst.
Thank you.

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follow:

Rosita Binti Jamaluddin, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Chairperson)

Norhaizan Mohd Esa, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Member)

BUJANG BIN KIM HUAT, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) were adhered to.

Signature: _____
Name of Chairman of Supervisory Committee: _____

Signature: _____
Name of Member of Supervisory Committee: _____

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AFM_1	Aflatoxin M_1
AFB_1	Aflatoxin B_1
HPLC	High Performance Liquid Chromatography
AFs	Aflatoxins
AKAP	Awareness, Knowledge, Attitude and Practice
EC	European Commission
ELISA	Enzyme Linked Immune sorbent Assay
HCC	Hepatocellular Carcinoma
LOD	Limit of Detection
LOQ	Limit of Quantification
r_s	Spearman rho
FAO	Food and Agriculture Organization of the United Nations
JECFA	Joint Expert Committee on Food Additives
ISIRI	Institute of Standard and Industrial Research of Iran

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Nowadays, globalisation does not only happen in term of technology, but increase of harmful exposure of food contamination is also a serious concern. Sustainable food supply becomes a challenging strategy in order to overcome shortage and contaminated food sources in the future. Moreover, Keesing et al. (2010) stated that since 1940 until today, more than 300 emerging diseases were discovered in humankind population all over the world and this issue significantly correlates with the diets (Newell et al., 2010). This situation becomes worse as the emergence of new disease towards human who are exposed to different chemicals including carcinogenic substances throughout their life increased vigorously (Afshar et al., 2013). Nevertheless, with a proper diet and controlled standard of food source in term of hygiene, contamination and safety, this global issue can be minimised or overcome successfully.

Food contamination can occur in many ways. One of them is through fungi producing toxin called mycotoxins where the ingestion of this nephrotoxic, immunotoxic, teratogenic and mutagenic toxin in grains by animals and human can cause bad impact towards the public health. Ironically, these toxins are capable of causing acute and chronic effects in human and animals in term of disorders of the central nervous, cardiovascular, pulmonary, intestinal tract systems and finally death (Makun et al., 2010). Aflatoxins (AFs) belong to a group of mycotoxins (O'Riordan & Wilkinson, 2008) where the four naturally occurring aflatoxins are aflatoxins B_1, aflatoxin B_2, alflatoxin G_1 and aflatoxin G_2. Among these four, the most commonly occurring and experiencing high carcinogenic effect is aflatoxin B_1 (AFB_1) (Polychronaki et al., 2008). Many cases of aflatoxin contamination had been reported by researchers all over the world including in Malaysia. In 1995, Lye et al. reported the occurrence of aflatoxin aroused since the outbreak of aflatoxicosis in Perak which resulted in acute hepatic encephalopathy among children originated from aflatoxin contamination. Although this phenomenon happened in the past, it does not mean that the same tragedy would not repeat in the future. As a prevention, many researchers around the world especially in Malaysia started to study food highly susceptible toward aflatoxin (Reddy et al., 2011), the exposure of the mycotoxins in human body (Leong et al., 2012a) and the effective ways (eg. diet) in reducing the level of aflatoxin exposure (Nasrabadi et al., 2013). From that continuous efforts, the exposure of aflatoxin in Malaysia so as other countries can be minimized and thus provide the community a safer food supply.

Ardic et al. (2009) explained that aflatoxin M_1 (AFM_1) is a major metabolite of AFB_1 and this metabolite can be found in milk and urine of humans, dairy cattle and other mammals that have consumed aflatoxin-contaminated food or feed. Secretion of AFM_1 in milk of dairy mammals then is continuously transferred into milk and

dairy products and reach human as the end consumer. On the global scale, the occurrence of AFM_1 in milk and dairy products is a serious concern as they are the main sources for introducing aflatoxins in the human diet (Muhammad et al., 2010). Located strategically in the equatorial area, Malaysia experienced tropical climate with humid and high temperature (Redzwan et al., 2013). These conditions are favorable for mycotoxin producing fungi to proliferate and cause contamination towards agricultural products. Later, the ingestion of AFB_1 contaminated feed by dairy livestock would transfer the AFM_1 into the animal's milk and followed by the collection of milk from the mammals for milk and dairy products industry. Since AFM_1 is not destroyed through pasteurization of milk, it will continue to be present in the powdered milk, yoghurt and other milk-based products (Duarte et al., 2013). Contamination of AFM_1 in milk and dairy products does not have to be questionable since there were many discoveries documented by researchers from Europe (Cano Sancho, 2013), Asia (Zheng et al., 2013) and the Middle East countries (Akrami et al., 2013). Realizing this world phenomenon, the European Commission (EC) had highlighted that the maximum permissible level of AFM_1 in milk and dairy products must not be more than 0.5 ng/kg (Tekinsen & Eken, 2008a) in order to ensure over the limit samples are discarded before reaching the consumers.

Redzwan et al. (2013) mentioned the exposure of AFM_1 does not only appear in food source but can also be detected in human biological samples such as serum AFB_1-DNA adduct, AFB_1-lysine adduct, so as the other metabolites in urine and faeces through the isolation of aflatoxin biomarker as reported by Wang et al. (1999), Mykkänen et al. (2005) and Polychronaki et al. (2008) This method then becomes a powerful tool to determine the molecular epidemiology of aflatoxin exposure of each individual in the community (Redzwan et al., 2013). The variation of urinary level of AFM_1 is dependent on many factors such as lifestyle, environmental factors, genetic susceptibility and nutritional status (Sabran et al., 2012). Hence, with these parameters, the progressive steps should be taken to increase the understanding of AFM_1 exposure in the community. Apart from that, the consumption of milk and dairy products are also said to be interrelated with the variation of AFM_1 in the urine samples (Sabran et al., 2012). In fact, there was a good correlation between AFB_1 dietary intake and urinary excretion of AFM_1 in adults (Zhu et al., 1987). Hence it clearly showed that the starting point of AFB_1 ingestion by the dairy livestock would expose AFM_1 metabolites in human urine sample who consumed milk and dairy products.

Modern and advanced detection tool is not enough to minimize the human exposure of AFM_1 unless the population themselves have sufficient knowledge about the aflatoxin and the food that are contaminated by these toxins. Action to control the aflatoxin contamination on groundnut was actually associated with the knowledge which is linked with the socio-demographic and socio-economic status of the individuals (Redzwan et al, 2012a). Transmitting the information like knowledge becomes one of the mechanisms for health communication capable to change the common health habit (Meyerowitz & Chaiken, 1987). Through this effort, the consumers are able to prevent themselves from being contaminated by aflatoxin and thus achieve better health. The three determinants, which are awareness, attitude and practice, are also important to measure the behavioral factors of human toward the

food contamination like AFM_1 in milk and dairy products. Therefore, with the proper exposure on aflatoxin and their effects on human health, the populations are more educated and more prepared to face with the food contamination challenges after this.

1.2 Problem statement

Nowadays, food contamination issues have aroused significant public concern from all over the world. Rodricks and Stoloff (1977) reported since the first outbreak of aflatoxin tragedy in rye by ergot alkaloid, produced by *Claviceps purpurea* in the early 1960s, many scientific researches were carried out in term of etiology of mycotoxicosis and prevention strategies. Until today, research on aflatoxin has been studied extensively by many countries including Malaysia. An acute outbreak of aflatoxicosis in Malaysia has been reported by Lye et al. (1995) where 78.5 % of the raw peanut kernel samples marketed in Malaysia were contaminated and of 78.5%, 10.71% exceeded the maximum tolerable limit of 15 ng/g. Interestingly, a study by Mohd Redzwan et al. (2012a) observed milk and dairy products consumption was positively associated with the level of AFM_1 in urine sample. Besides, respondents who consumed milk and dairy products above median (67.79 g/day) had high level of AFM_1 compared to their counterpart.

Although AFM_1 has been found to be less carcinogenic and mutagenic compared to AFB_1, it has the ability to exhibit a high level of genotoxic activity. This will cause health risk due to the possibilities to accumulate and damage DNA; particularly at guanine residues (Lafont et al., 1989; Wang & Groopman., 1999). Since in Malaysia many types of milk and dairy products are sold abundantly in the market, the consumers have high possibility to be contaminated by this harmful fungus. Considering this phenomenon of aflatoxin exposure in Malaysia had happened before, it is therefore important to study the association of milk and dairy products acceptability and their consumption pattern with the level of urinary AFM_1 and socio-demographic factors. A positive association was found between aflatoxin in nut and nut products intake with the socio-demographic and dietary status (Leong et al., 2011a). Unfortunately, till today no data had been presented in investigating the relationship between milk and dairy products intake in relation to aflatoxin exposure with different socio-demographic and socio-economic characteristics among urban and rural communities.

The Malaysian themselves are not exposed with the knowledge of aflatoxin in milk and dairy products. Redzwan et al. (2012a) reported that most of the non-academic staff in a faculty at Universiti Putra Malaysia knew about the presence of fungal infection in the foodstuffs, and yet they did not know about aflatoxin. From this data, it clearly shows that the people in Malaysia are still far behind in exploring the knowledge on aflatoxin. The knowledge, awareness, attitude and practice become four important tools to measure the understanding of individuals on food contamination and their implication toward global health. High intake of aflatoxin-contaminated foods among human actually resulted from low awareness and knowledge about fungal infection and aflatoxin contamination in food stuffs

(Redzwan et al., 2012a). Thus, the higher ingestion of AFB_1 and AFM_1 will cause higher detection of AFM_1 in urine samples. So with this explanation, determining the subjects' knowledge, awareness, attitude and practice are crucial as one of the steps to reduce aflatoxin exposure in Malaysia.

1.3 Significance of the study

The result obtained from this research could provide clear guidelines for food supplier or importer to ensure the level of AFM_1 in milk and dairy products does not exceed the Malaysia permissible limit which is 500 ng/L (Food Safety Information System of Malaysia [FoSIM], 2012). Otherwise, the samples must be strictly discarded before entering the market. Many reports had been documented about the content of AFB_1 in agricultural crops like spices, cereals, and peanuts (Masoero et al., 2009). Considering these crops as the main food sources for livestocks, the initial steps to ensure low or no aflatoxin contamination present in the feed is really important before the transmission of aflatoxin into milk products. Hence, the collected data could prepare a basic parameter for the Ministry of Domestic Trade, Cooperative and Consumerism to set up a new policy regarding the exposure of aflatoxin. The final results and summary drawn from this study will also be beneficial for policy makers in the central and local governments, extension agents to implement the strict regulation on AFB_1 in food and feed to reduce or avoid the contamination of AFM_1 in milk and dairy products (Iqbal et al., 2013).

Apart from that, by determining the factors affecting the higher level of AFM_1 in urine samples, the Ministry of Health, hospital, higher educational institution and private health related company can conduct an appropriate type of education or intervention programs that can increase the level of awareness among Malaysians. Thus, this can reduce the occurrence level of AFM_1 exposure within various populations. Besides, these results also provide new findings about the pattern of milk and dairy products intake between two different living areas. It is an initial step in understanding milk consumption patterns in detail which eventually leads to further analysis on the relationship between these eating patterns with the exposure of AFM_1.

1.4 Study Objectives

1.4.1 General Objective

To study the occurrence of AFM_1 in urine samples and their associated factors among residents in Terengganu.

1.4.2 Specific objectives

Part 1

1) To determine the associations between socio-demographic and socio-economic statuses with the total score of awareness, knowledge, attitude and practice on aflatoxin.
2) To determine the associations and relationships between socio-demographic, socio-economic statuses, the total score of awareness, knowledge, attitude and practice on aflatoxin with milk and dairy products consumption.
3) To determine the associations and relationships between socio-demographic, socio-economic statuses, milk and dairy products consumption, total score of awareness, knowledge, attitude and practice on aflatoxin with the occurrence of AFM1 in urine samples.

Part 2

4) To analyse the occurrence and level of AFM1 in commonly consumed types and brand of milk and dairy products
5) To determine the relationship between the ingestion of AFM1 through milk and dairy products consumption and the level of urinary AFM1.

1.5 Null Hypothesis

Ho1 = There are no significant associations between socio-demographic and socio-economic statuses with the total score of awareness, knowledge, attitude and practice on aflatoxin.

Ho2 = There are no significant associations and relationships between socio-demographic, socio-economic statuses, the total score of awareness, knowledge, attitude and practice on aflatoxin with milk and dairy products consumption.

Ho3 = There are no significant associations and relationship between socio-demographic, socio-economic statuses, the consumption of milk and dairy products, total score of awareness, knowledge, attitude and practice on aflatoxin with the occurrence of AFM1 in urine sample.

Ho4 = There is no significant correlation between the ingestion of AFM1 through milk and dairy products and the level of urinary AFM1.

1.6 Conceptual Framework

The conceptual framework (Figure 1.1) showed this study was conducted to investigate the associations between all parameters in the socio-demographic statuses, socio-economic statuses, the consumption of milk and dairy products, score of subjects' determinants (awareness, knowledge, attitude and practice) and the occurrence of urinary AFM_1.

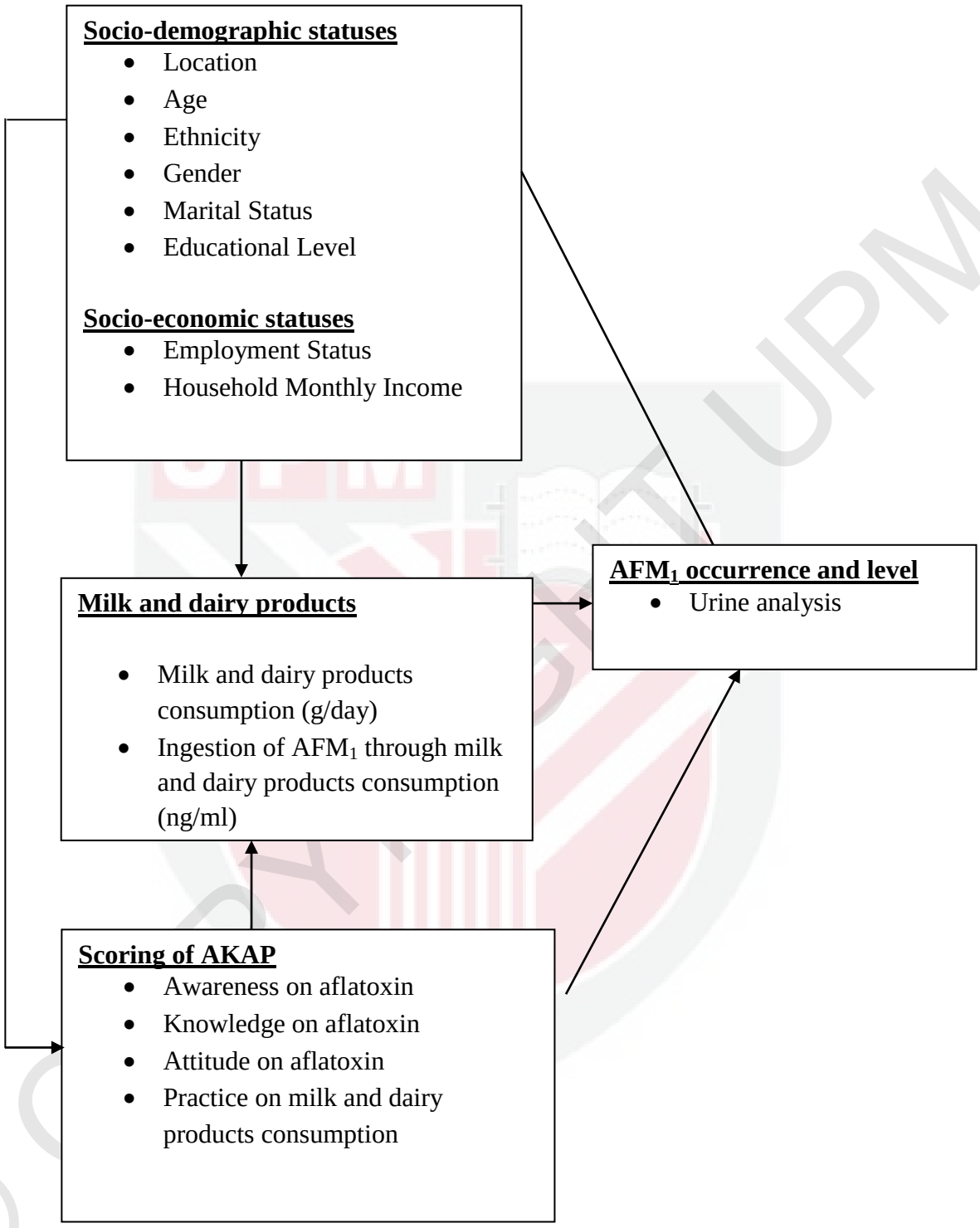

Figure 1.1: Conceptual Framework the Study

REFERENCES

Abdullah, N., Nawawi, A., & Othman, I. (1998). Survey of fungal counts and natural occurrence of aflatoxins in Malaysian starch-based foods. *Mycopathologia*, 143, 53–58.

Afshar, P., Shokrzadeh, M., Kalhori, S., Babaee, Z., & Saeedi Saravi, S. S. (2013). Occurrence of ochratoxin A and aflatoxin M_1 in human breast milk in Sari, Iran. *Food Control*, 31(2), 525–529.

Ali, N., Hashim, N. H., & Shuib, N. S. (2015). Natural occurrence of aflatoxins and ochratoxin A in processed spices marketed in Malaysia. *Food Additives & Contaminants: Part A*, 32(4), 518–532.

Alonso, V. A., Monge, M. P., Larriestra, A., Dalcero, A. M., Cavaglieri, L. R., & Chiacchiera, S. M. (2010). Naturally occurring aflatoxin M_1 in raw bulk milk from farm cooling tanks in Argentina. *Food Additives and Contaminants: Part A*, 27, 373-379.

Akrami Mohajeri, F., Ghalebi, S. R., Rezaeian, M., Gheisari, H. R., Khorramdel Azad, H., Zolfaghari, A., & Fallah, A. (2013). Aflatoxin M_1 contamination in white and Lighvan cheese marketed in Rafsanjan, Iran. *Food Control*, 33, 525-527.

Ardic, M., Karakaya, Y., Atasever, M., & Adiguzel, G. (2009). Aflatoxin M_1 levels of Turkish white brined cheese. *Food Control*, 20(3), 196–199.

Armorini, S., Altafini, A., Zaghini, A., & Roncada, P. (2015). Occurrence of aflatoxin B_1 in conventional and organic flour in Italy and the role of sampling. *Food Control*, 50, 858–863.

Awuah, R. T., & Kpodo, K. A. (1996). High incidence of Aspergillus flavus and aflatoxins in stored groundnuts in Ghana and the use of microbial assay to assess the inhibitory effects of plant extracts on aflatoxin synthesis. *Mycopathologia*, 134, 109–114.

Aycicek, H., Aksoy, A., & Saygi, S. (2005). Determination of aflatoxin levels in some dairy and food products which consumed in Ankara, Turkey. *Food Control*, 16(3), 263–266.

Ayub, M. Y., & Sachan, D. S. (1997). Dietary factors affecting aflatoxin B_1 carcinogenicity. *Malaysian Journal Nutrition*, 3, 161–179.

Baker, G. A. (2003). Food safety and fair: factors affecting consumer response to food safety risk. Paper presented at the International Food and Agribusiness Management Association (IAMA) and Agribusiness Institute in the Leavey School of Business, Santa Clara University, 500 El. Camino Real, Santa Clara, CA 93053, USA. 2003.

Bakirci, I. (2001). A study on the occurrence of aflatoxin M_1 in milk and milk products produced in Van province of Turkey. *Food Control,* 12, 47-51.

Boudra, H., Barnouin, J., Dragacci, S., & Morgavi, D. P. (2007). Aflatoxin M_1 and ochratoxin A in raw bulk milk from French dairy herds. *Journal of Dairy Science,* 90, 3197-3201.

Balata, M. A., & Bahout, A. A. (1996). Aflatoxin M_1 in camel's milk Giza-Egypt. *Journal of Veterinary Medicine,* 44(2A), 109–111.

Bandura, A. (2004). Health promotion by socio cognitive means. *Health Education & Behaviour,* 31, 143-164.

Bankole, S. A., Adenusi, A. A., Lawal, O. S., & Adesanya, O. O. (2010). Occurrence of aflatoxin B_1 in food products derivable from "egusi" melon seeds consumed in southwestern Nigeria. *Food Control*, 21(7), 974–976.

Barbilori, A., Bonomi, F., Benedetti, S., Mannino, S., Monti, L., Cattaneo, T., & Iametti, S. (2007). Binding of aflatoxin (M1) to different protein fraction in ovine and caprine milk. *Journal of Dairy Science,* 90, 533-540.

Battacone, G., Nudda, A., Palomba, M., & Pascale, M. (2005). Transfer of aflatoxin B_1 from feed to milk and from milk to curd and whey in dairy sheep fed artificially contaminated concentrates. *Journal of Dairy Science,* 88, 3063-3069.

Beck, T. K., Jensen, S., Simmelsgaard, S. H., Kjeldsen, C., & Kidmose, U. (2015). Consumer clusters in Denmark based on coarse vegetable intake frequency, explained by hedonics, socio-demographic, health and food lifestyle factors. A cross-sectional national survey. *Appetite*, 91, 366–374.

Beheshti, H. R., Feizy, J., Khoshbakht Fahim, N., Fakoor Janati, S. S., Asadi, M., & Mihanparast, S. (2012). Aflatoxins and ochratoxin A in dried fruits from Iran. *Acta Horticulturae*, 963, 199–202.

Bennett, J. W. (1987). Mycotoxins, mycotoxicoses, mycotoxicology and mycopathology. *Mycopathlogia*, 100, 3–5.

Bennett, J. W., & Klich, M. (2003). Mycotoxins. *Clinical Microbiology Reviews*, 16, 497.

Bezabih, M., & Tamir, B. (2013). Mycotoxines and/ or Aflatoxines in milk and milk products: Review. *American Scientific Research Journal for Engineering, Tecnology, and Sciences (ASRJETS)*, 7(1), 1-32.

Bhat, R. V., & Vasanthi, S. (2003). Food Safety in Food Security and Food Trade: Mycotoxin Food Safety Risk in Developing Countries. Washington D.C. International Food Policy Research Institute, 2003, (Brief 3)

Bilandžić, N., Božić, Đ., Đokić, M., Sedak, M., Kolanović, B. S., Varenina, I., Cvetnić, Ž. (2014a). Seasonal effect on aflatoxin M_1 contamination in raw and UHT milk from Croatia. *Food Control*, 40, 260–264.

Bilandžić, N., Božić, Đ., Đokić, M., Sedak, M., Kolanović, B. S., Varenina, I., Cvetnić, Ž. (2014b). Assessment of aflatoxin M_1 contamination in the milk of four dairy species in Croatia. *Food Control,* 43, 18–21.

Blanc, M., Karleskind, A. (1981). Contamination of milk and dairy products by aflatoxin M1 in France. *Le Lait,* 481-483.

Blanco, J. L., Domingues, L., Gomez-lucia, E., Garayzabal, J. F. F., Goyache, J., Suarez, G. (1988). Behavior of aflatoxin during the manufacture, ripening and storage of Manchego-type cheese. *Journal of Food Science,* 53, 1373–1376.

Brasil. (2002). Resolução n 274 de 15/10/2002 da ANVISA. Approves the Technical Regulation on maximum levels for aflatoxins in milk, peanuts and corn. Official Gazette , Brazil, DF. [Sec. I, 16/10/ 2002].

Cano Sancho, G., Marin, S., Ramos, A. J., Peris-Vicente, J., & Sanchis, V. (2010). Occurrence of aflatoxin M1 and exposure assessment in Catalonia (Spain). *Revista Iberoamericana de Micología,* 27,130-135.

Cano Sancho, G. (2013). Exposure assessment of Catalonian population to mycotoxins. PhD Thesis, University of Lleida.

Cardwell, K. F., Desjardins, D., & Henry, S. H. (2004). The cost of achieving food security and food quality. Retrieved from http://www.apsnet.org/online/festure/ mycotoxin/top.html February 20, 2015.

Carvajal, M., Bolaños, A., Rojo, F., & Méndez, I. (2003). Aflatoxin M1 in pasteurized and ultrapasteurized milk with different fat content in Mexico. *Journal of Food Protection,* 66, 1885-1892.

CDC, Center for Disease Control and Prevention. (2004). Outbreak of aflatoxin poisoning in eastern and central provinces, Kenya, January–June 2004. *Morbidity and Mortality Weekly Report,* 53 (34), 790–793.

CAST, Council for Agricultural Science and Technology. (2003). Mycotoxins: Risks in Plant, Animal and Human Systems. Report No. 139., Ames, Iowa, USA.

Cathey, C. G., Nuang, Z. G., Sarr, A. B., Clement, B. A., & Phililips, T. D. (1994). Development and evaluation of a minicolumn assay from the detection of aflatoxin M_1 in milk. *Journal of Dairy Science,* 77, 1223– 1231.

Cheng, Z., Root, M., Pan, W., Chen, J., & Campbell, C.T. (1997). Use of improved method for analysis of urinary aflatoxin M_1 in a survey of Mailand China and Taiwan. *Cancer Epidemiology, Biomarker and Prevention Journal,* 6, 523–529.

Creppy, E. E. (2002). Update of survey, regulation and toxic effects of mycotoxins in Europe. *Toxicology Letters*, 127, 19-28.

Daniel, W. W. (1999). *Biostatistics: A Foundation for Analysis in the Health Sciences.* 7th Edition. New York: John Wiley & Sons.

Darsanaki, R. K., Chakoosari, M. M. D., & Aliabadi, M. A. (2013). Aflatoxin M_1 contamination in milk and milk products in Iran: A Review. *Journal of Chemical Health Risks,* 3(3), 13-20.

Dashti, B., Al-Hamli, S., Alomirah, H., Al-Zenki, S., Abbas, A. B., & Sawaya, W. (2009). Levels of aflatoxin M_1 in milk, cheese consumed in Kuwait and occurrence of total aflatoxin in local and imported animal feed. *Food Control*, 20(7), 686–690.

Davidson, D. J., & Freudenburg, W. R. (1996). Gender and environmental risk concerns: A review and analysis of available research. *Environment and Behavior*, 28, 302–339.

Department of Development and Planning Kuala Terengganu. (2013). *List of Residential Units in Kuala Terengganu*. Kuala Terengganu City Council.

Department of Development, Planning and Landscape Marang. (2013). *List of Residential Units in Marang*. Marang District Council.

Department of Information Kuala Terengganu. (2009). *Map of State*. Retrieved from http://www.penerangan.gov.my/terengganu/index.php/bm/maklumat/peta-negeri February, 21, 2013.

Desalegn**,** B., Nanayakkara, S., Harada, K., Hitomi, T., Chandrajith, R., & Karunaratne, U. (2011). Mycotoxin detection in urine samples from patients with chronic kidney disease of uncertain etiology in Sri Lanka. *Bulletin of Environmental Contamination and Toxicology,* 87, 6–10.

Deveci, O. (2007). Changes in the concentration of aflatoxin M_1 during manufacture and storage of white pickled cheese. *Food Control,* 18(9), 1103-1107.

Diaz, G. J., & Espitia, E. (2006). Occurrence of aflatoxin M_1 in retail milk samples from Bogotá, Colombia. *Food Additives and Contaminants, Vol. 23, Iss: 8,* pp. 811–815. Doi: 10.1080/02652030600681617.

Dosako, S., Kaminogawa, S., Taneya, S., & Yamauchi, K. (1980). Hydrophobic surface areas and net charges of as1-, k-casein and as1- casein: k-casein complex. *Journal of Dairy Research,* 4 (7), 123–129.

Dosman, D. M., Adamowicz, W. L., & Hrudey, S. E. (2001). Socio-economic determinants of health and food safety-related risk perceptions. *Risk Analysis*, 21, 307–317.

Duarte, S. C., Almeida, A. M., Teixeira, A. S., Pereira, A. L., Falcão, A. C., Pena, A., & Lino, C. M. (2013). Aflatoxin M_1 in marketed milk in Portugal: Assessment of human and animal exposure. *Food Control*, *30*(2), 411–417.

EC, European Communities. (2001). Commission regulation (EC) No. 466/2001 of 8 March 2001 setting maximum levels for certain contaminants in foodstuffs. Official J. European Communities L77, 44: 1-16.

Elgerbi, A. M., Aidoo, K. E., Kandlish, A. A. G., & Tester, R. F., (2004). Occurrence of aflatoxin M_1 in randomly selected North African milk and cheese samples. *Food Additives & Contaminant,* 21: 592–597.

Elkak, A., El Atat, O., Habib, J., & Abbas, M. (2012). Occurrence of aflatoxin M_1 in cheese processed and marketed in Lebanon. *Food Control*, 25(1), 140–143.

El Khoury, A., Atoui, A., & Yagh, J. (2011). Analysis of aflatoxin M_1 in milk and yogurt and AFM_1 reduction by lactic acid bacteria used in Lebanese industry. *Food Control*, 22, 1695-1699.

El Marnissi, B., Belkhou, R., Morgavi, D. P., Bennani, L., & Boudra, H. (2012). Occurrence of aflatoxin M_1 in raw milk collected from traditional dairies in Morocco. *Food and Chemical Toxicology*, 50(8), 2819–2821.

Er, B., Demirhan, B., & Yentür, G. (2014). Short communication : Investigation of aflatoxin M_1 levels in infant follow-on milks and infant formulas sold in the markets of Ankara , Turkey. *American Dairy Science Association,Vol. 97,* pp. 3328–3331. Doi: 10.3168/jds.2013-7831.

Ertas, N., Gonulalan, Z., Yildirim, Y., & Karadal, F. (2011). A survey of concentration of aflatoxin M_1 in dairy products marketed in Turkey. *Food Control, Vol, 22, Iss: 12,* pp. 1956–1959. Doi: 10.1016/j.foodcont.2011.05.009.

Ezekiel, C. N., Sulyok, M., Babalola, D. A., Warth, B., Ezekiel, V. C., & Krska, R. (2013). Incidence and consumer awareness of toxigenic Aspergillus section Flavi and aflatoxin B_1 in peanut cake from Nigeria. *Food Control, Vol. 30, Iss: 2,* pp. 596-601. Doi: 10.1016/j.foodcont.2012.07.048

Ezekiel, C. N., Warth, B., Ogara, I. M., Abia, W. a., Ezekiel, V. C., Atehnkeng, J., & Bandyopadhyay, R. (2014). Mycotoxin exposure in rural residents in northern Nigeria: A pilot study using multi-urinary biomarkers. *Environment International, Vol. 66,* pp. 138–145. Doi: 10.1016/j.envint.2014.02.003

Fallah, A.A., Jafari, T., Fallah, A., Rahnama, M. (2009). Determination of aflatoxin M_1 levels in Iranian white and cream cheese. *Food and Chemical Toxicology,* 47, 1872–1875.

Fallah, A. A. (2010). Aflatoxin M_1 contamination in dairy products marketed in Iran during winter and summer. *Food Control, Vol. 21, Iss: 11,* pp. 1478–1481. Doi: 10.1016/j.foodcont.2010.04.017

Fallah, A. A., Rahnama, M., Jafari, T., & Saei-Dehkordi, S. S. (2011). Seasonal variation of aflatoxin M_1 contamination in industrial and traditional Iranian dairy products. *Food Control,* 22, 1653-1656.

FAO, Food and Agriculture Organization of the United Nations. (2004). Worldwide regulations for mycotoxins in food and feed in 2003.

Finoli, C., & Vecchio, A. (2003). Occurrence of aflatoxins in feedstuff, sheep milk and dairy products in western Sicily.Ital. *Journal of Animal Science, 2*, 191–196.

FoSIM, Food Safety Information System of Malaysia. (1985). Food Safety and Quality Division, Department of Public Health, Ministry of Health Malaysia. Retrieved from http://fsis2.moh.gov.my on March 16, 2015

Fontaine, K., Passeró, E., Vallone, L., Hymery, N., Coton, M., Jany, J.-L., & Coton, E. (2015). Occurrence of roquefortine C, mycophenolic acid and aflatoxin M_1 mycotoxins in blue-veined cheeses. *Food Control, Vol. 47*, pp. 634–640. Doi: 10.1016/j.foodcont.2014.07.046

Galef, B. G., & Whiskin, E. E. (2000). Social influences on the amount of food eaten by Norway rats. *Appetite, Vol. 34, Iss: 3,* pp. 327-332. Doi: org/10.1006/appe.2000.0314

Galvano, F., Galofaro, V., De Angelis, A., Galvano, M., Bognanno, M., & Galvano, G. (1998). Survey of the occurrence of aflatoxin M_1 in dairy products marketed in Italy. *Journal of Food Protection,* 61, 738-741.

Galvano, F., Galofaro, V., Ritieni, A., Bognanno, M., De Angelis, A., & Galvano, G. (2001). Survey of the occurrence of aflatoxin M_1 in dairy products marketed in Italy: second year of observation. *Food Additives and Contaminants,* 18, 644-646.

García Londoño, V.A., Boasso, A. C., de Paula, M. C. Z., Garcia, L. P., Scussel, V. M., Resnik, S., & Pacín, A. (2013). Aflatoxin M_1 survey on randomly collected milk powder commercialized in Argentina and Brazil. *Food Control*, 34 (2), 752–755.

George, D., & Mallery, P. (2003*). SPSS for Windows step by step: A simple guide and reference.* 11.0 update (4th ed.). Boston: Allyn & Bacon.

Ghanem, I., & Orfi, M. (2009). Aflatoxin M_1 in raw, pasteurized and powdered milk available in the Syrian market. *Food Control*, 20(6), 603–605.

Gomez Arranz, E., & Navarro Blasco, I. (2010). Aflatoxin M_1 in Spanish infant formulae: occurrence and dietary intake regarding type, protein-base and physical state. *Food Additives and Contaminants: Part B,* 3, 193-199.

Groopman, J. D., Kensler, T. W., & Wild, C. P. (2008). Protective interventions to prevent aflatoxin-induced carcinogenesis in developing countries. *Annual*

Review of Public Health, Vol. 29, pp. 187-203. Doi: 10.1146/annurev.publhealth.29.020907.090859

Guengerich, F. P. (1999). Cytochrome P-450 3A4: Regulation and role in drug metabolism. *Annual Review of Pharmacology Toxicology*, 39, 1-17.

Guengerich, F. P., Arneson, K. O., Williams, K. M., Deng, Z., & Harris, T. M. (2002). Reaction of aflatoxin B(1) oxidation products with lysine. *Chemical Research of Toxicology,* 15, 780–792.

Guerre, P., Bailly, J. D., Bernard, G., & Burgat, V. (2000). Excretion of mycotoxins into milk: What are the risks to the consumer? *Revue de Medecine Veterinaire*, 151, 7- 22.

Hall, A. J., & Wild, C. P. (1994). Epidemiology of aflatoxin related disease. In D. L. Eaton & J. D. Groopman (Eds.), *The toxicology of aflatoxins: Human health, veterinary, and agricultural significance* (pp. 223–258). San Diego, CA: Academic Press.

Hamid, A.B., Mehan, V. K., & Gowda, C. L. L. (Eds.). (1997). Proceeding from First AsiaWorking GroupMeeting, (Hyderabad: International Crops Research Institute for the Semi-Arid Tropics) *: Present status and future prospects of research on the ground- nuts aflatoxin problem in Malaysia in Aflatoxin Contamination Problems in Groundnut in Asia.*

Han, R. W., Zheng, N. Wang, J. Q., Zhen, Y. P., Xu, X. M., & Li, S. L. (2013). Survey of aflatoxin in dairy cow feed and raw milk in China. *Food Control, Vol. 34, Iss: 1,* pp. 35–39. Doi: org/10.1016/j.foodcont.2013.04.008

Hatem, N. L., Hassab, H. M., Abd Al-Rahman, E. M., El Deeb, S. A., & El Sayed Ahmed, R. L., (2005). Prevalence of aflatoxins in blood and urine of Egyptian infants with protein-energy malnutrition. *Food Nutrition Bulletin*, 26, 49–56.

Heidtmann Bemvenuti, R., Mendes, G. L., Scaglioni, P. T., Badiale-Furlong, E., & Souza-Soares, L. A. (2011). Biochemistry and metabolism of mycotoxins: *A review. African Journal of Food Science*, 5(16), 861-869.

Henry, S. H., Whitaker, T., Rabbani, I., Bowers, J., Park, D., Price, W., Bosch, F.X., Pennington, J., Verger, P., Yoshizawa, T., Van Egmond H., Jonker, M. A. & Coker, R. (2001). *Aflatoxin M1: Joint Expert Committee on Food Additives (JECFA)*. Hamilton, Ontario, Canada.

Hong, L. S., Mohd Yusof, N. I., & Ling, H. M. (2010). Determination of aflatoxin B_1 and B_2 in peanuts and corn based products. *Sains Malaysiana*, 39(5), 731–735.

Huang, C. L. (1993). Simultaneous-equation model for estimating consumer risk per- ceptions, attitudes, and willingness-to-pay for residue-free produce. *Journal of Consumer Affairs* 27 (2), 377–396.

Hussain, I., Anwar, J., Asi, M. R., & Munawar, Kashif. M. (2010). Aflatoxin M_1 contamination in milk from five dairy species in Pakistan. *Food Control,* 21, 122-124.

IARC, International Agency for Research on Cancer. (1993). IARC monographs on the evaluation of carcinogenic risks to humans. *Some naturally occurring substances: Food items and constituents, heterocyclic aromatic amines and mycotoxins*, 56, 19-23.

IARC, International Agency For Research On Cancer. (2002). Monograph on the evaluation of carcinogenic risk to humans. *Some traditional herbal medicines, some mycotoxins. Naphtalene and Styrene,* 82,173-245.

ICRISAT, International Crops Research Institute for the Semi-Arid Tropics. (2012). Properties of aflatoxin and it producing fungi. Retrieved from http:// www.icrisat.org/aflatoxin/aflatoxin.asp. Accessed 23 February 2014

Iha, M. H., Barbosa, C. B., Okada, I. A., & Trucksess, M. W. (2011). Occurrence of aflatoxin M_1 in dairy products in Brazil. *Food Control, 22*, 1971–1974. Doi: 10.1016/j.foodcont.2011.05.013

Ilesanmi, F. F., & Ilesanmi, O. S. (2011). Knowledge of aflatoxin contamination in groundnut and the risk of its ingestion among health workers in Ibadan , Nigeria. *Asian Pacific Journal of Tropical Biomedicine, Vol. 1, Iss: 6*, 493–495. Doi: 10.1016/S2221-1691(11)60108-1

Iqbal, S. Z., Asi, M. R., & Jinap, S. (2013). Variation of aflatoxin M_1 contamination in milk and milk products collected during winter and summer seasons. *Food Control, Vol. 34*, 714–718. Doi: 10.1016/j.foodcont.2013.06.009

ISIRI, Institute of Standard and Industrial Research of Iran. (2002). Maximum tolerated limits of mycotoxins in foods and feeds. National Standard No. 5925.

Jager, A. V., Ramalho, F. S., Zambelli, L. N., Augusto, C., & Oliveira, F. (2007). Biomarkers of aflatoxin exposure and its relationship with the hepatocellular carcinoma. *Intec,*107-126.

Jalili, M., & Jinap, S. (2012). Natural occurrence of aflatoxins and ochratoxin A in commercial dried chili. *Food Control*, 24, 160–164.

Jarvis, B. B. (2002). Chemistry and toxicology of molds isolated from water-damaged buildings. Mycotoxins and food safety. *Advance in Experimental Medicine and Biology*, 504, 43–52.

Jayarao, B. M., Donaldson, S. C., Straley, B. A, Sawant, A. A., Hegde, N. V, & Brown, J. L. (2006). A survey of foodborne pathogens in bulk tank milk and raw milk consumption among farm families in pennsylvania. *Journal of Dairy Science, Vol. 89, Iss: 7*, pp. 2451–2458. Doi:10.3168/jds.S0022-0302(06)72318-9

JECFA, Joint FAO/WHO Expert Committee on Food Additives. (2001). Safety Evaluation of Certain Mycotoxins in Food. In Prepared by the 56th meeting of the JECFA (Joint FAO/WHO Expert Committee on Food Additives Series No. 47. Retrieved from www.inchem.org/ documents/jecfa/jecmono/v47je02.htm 2015 March 20.

Jolly, P., Jiang, Y., Ellis, W., Awuah, R., Nnedu, O., Phillips, T., & Jolly, C. (2006). Determinants of aflatoxin levels in Ghanaians: Sociodemographic factors, knowledge of aflatoxin and food handling and consumption practices. *International Journal of Hygiene and Environmental Health*, 209(4), 345–358.

Jolly, C. M., Bayard, B., Awuah, R. T., Fialor, S. C., & Williams, J. T. (2009). Examining the structure of awareness and perceptions of groundnuts aflatoxin among Ghanaian health and agricultural professionals and its influence on their actions. *Journal of Socio-economics*, 38, 280-287.

Jonsyn Ells, F. (2000). Seasonal variation in exposure frequency and concentration levels of aflatoxins and ochratoxins in urine samples of boys and girls. *Mycopathologia,* 152, 35–40.

Kang'ethe, E. K., & Lang'a, K. A. (2009). Aflatoxin B_1 and M_1 contamination of animal feeds and milk from urban centers in Kenya. *African Health Sciences,* 9(4), 218-226.

Kaniou Grigoriadou, I., Eleftheriadou, A., Mouratidou, T., & Katikou, P. (2005). Determination of aflatoxin M_1 in ewe's milk samples and the produced curd and feta cheese. *Food Control,* 16, 257–261.

Keesing, F., Belden, L. K., Daszak, P., Dobson, A., Harvell, C. D., Holt, R. D., & Ostfeld, R. S. (2010). Impacts of biodiversity on the emergence and transmission of infectious diseases. *Nature, Vol. 468, Iss: 7324,* pp. 647–52. Doi: 10.1038/nature09575

Kensler, T. W., Roebuck, B. D., Wogan, G. N., & Groopman, J. D. (2011). Aflatoxin: a 50-year odyssey of mechanistic and translational toxicology. *Toxicological Sciences,* 120, 28-48.

Khayoon, W. S., Saad, B., Lee, T. P., & Salleh, B. (2012). High performance liquid chromatographic determination of aflatoxins in chili, peanut and rice using silica based monolithic column. *Food Chemistry. Vol. 133*, pp. 489–496. Doi: 10.1016/j.foodchem.2012.01.010

Kiermeier, F.,.& Mucke (1972). Aflatoxin M_1. *Z Lebensmettle Unter Forsch.,* 151, 392-397.

Kim, E. K., Shon, D. H., Ryu, D., Park, J.W., Hwang, H. J., Kim, Y. B. (2000). Occurrence of aflatoxin M_1 in Korean dairy products determined by ELISA and HPLC. *Food Additives and Contaminants,* 17 (1), 59–64.

Kitya, D., Bbosa, G. S., & Mulogo, E. (2010). Aflatoxin levels in common foods of South Western Uganda: a risk factor to hepatocellular carcinoma. *European Journal of Cancer Care, Vol. 19, Iss: 4,* pp. 516–21. Doi: 10.1111/j.1365-2354.2009.01087.x

Kolsova, A. Y., Shim, W. B., Yang, Z. Y., Eremin, S. A., & Chung., D. H. (2006). Direct competitive ELISA based on a monoclonal antibody for detection of aflatoxin B_1. Stabilization of ELISA kit components and application to grain samples. *Analytical and Bioanalytical Chemistry,* 384, 286–294

KFDA, Korea Food and Drug Administration. (2003). *Korea Food Code,* 320– 322.

Kos, J., Levic, J., Duragic, O., Kokic, B., & Miladinovic, I. (2014). Occurrence and estimation of Aflatoxin M_1 exposure in milk in Serbia. *Food Control,* 38, 41-46.

Kpodo, K., Thrane, U & ., Hald, B., (2000). Fusaria and fumonisins in maize from Ghana and their co-occurrence with aflatoxins. *International Journal of Food Microbiology,* 61, 147–157

Krewki, D.P., Slovic, S., & Bartlett, J. (1994). *Health risk perceptions in Canada (ERC 94-3), environmental risk management*. Working paper. University of Alberta, Edmonton, Alta., Canada.

Kuiper, H. A., Kleter, G. A., Prandini, A., Tansini, G., Sigolo, S., Filippi, L., & Piva, G. (2009). On the occurrence of aflatoxin M_1 in milk and dairy products. *Food and Chemical Toxicology,* 47(5), 984–991.

Lafont, P., Siriwardana, M., & Lafont, J. (1989). Genotoxicity of hydroxyl – Aflatoxins M_1 and M_4. *Microbiologie Aliments Nutrition,* 7, 1–8.

Leblanc, J. C., Tard, A., Volatier, J. L., & Verger, P. (2005). Estimated dietary exposure to principal food mycotoxins from The First French Total Diet Study. *Food Additives and Contaminants: Part A,* 22, 652-672.

Lee, J. E., Kwak, B. M., Ahn, J. H., & Jeon, T. H. (2009). Occurrence of aflatoxin M1 in raw milk in South Korea using an immunoaffinity column and liquid chromatography. *Food Control, Vol. 20, Iss: 2,* pp. 136–138. Doi: 10.1016/j.foodcont.2008.03.002

Lei, Y., Fang, L., Akash, M. S. H., Rehman, K., Liu, Z., Shi, W., Chen, S. (2013). Estimation of urinary concentration of aflatoxin M_1 in Chinese pregnant women. *Journal of Food Science,* 78, 1835- 1838.

Leong, Y. H., Ismail, N., Latif, A. A., & Ahmad, R. (2010). Aflatoxin occurrence in nuts and commercial nutty products in Malaysia. *Food Control,* 21, 334-338.

Leong, Y. H., Rosma, A., Latiff, A. A., & Izzah, A. N. (2012a). Associations of serum aflatoxin B_1-lysine adduct level with socio-demographic factors and aflatoxins intake from nuts and related nut products in Malaysia.

International Journal of Hygiene and Environmental Health, Vol. 215, Iss: 3, pp. 368–372. Doi: 10.1016/j.ijheh.2011.12.005

Leong, Y. H., Latiff, A. A, Ahmad, N. I., & Rosma, A. (2012b). Exposure measurement of aflatoxins and aflatoxin metabolites in human body fluids. A short review. *Mycotoxin Research, Vol. 28, Iss: 2,* pp. 79–87. Doi: 10.1007/s12550-012-0129-8

Leong, Y. H., Imail, N., Latif, A.A., Nurul Izzah, A., Narazah, M.Y., & Nurul Ain, A.B. (2011a). Nuts consumption pattern among Malaysian adults: a socio-demographic and dietary behavior perspective. *International Food Research Journal*, 18 (1), 319–328.

Leong, Y. H., Rosma, A., Latiff, A.A., & Ahmad, N.I. (2011b). Exposure assessment and risk characterization of aflatoxin B_1 in Malaysia. *Mycotoxin Research,* 27, 207–214.

Lin, L. C., Liu, F. M., Fu, Y. M., & Shih, D. Y. C. (2004). Survey of aflatoxin M_1 contamination of dairy Products in Taiwan. *Journal of Food and Drug Analysis,* 12(2), 154-160.

Lye, M. S., Ghazali, A. A., Mohan, J., Alwin, N., & Mair, R. C. (1995). An outbreak of acute hepatic encephalopathy due to severe aflatoxicosis in Malaysia. *The American Journal of Tropical Medicine and Hygiene,* 53, 68-72.

Makun, H. A., Anjorin, S. T., Moronfoye, B., Adejo, F. O., Afolabi, O. A., Fagbayibo, G., & Surajudeen, A. A. (2010). Fungal and aflatoxin contamination of some human food commodities in Nigeria. *African Journal of Food Science,* 4(4), 127–135.

Malir, F., Ostry, V., Grosse, Y., Roubal, T., Skarkova, J., & Ruprich, J. (2006). Monitoring the mycotoxins in food and their biomarkers in the Czech Republic. *Molecular Nutrition and Food Research, Vol. 50,* pp. 513–518. Doi: 10.1002/mnfr.200500175

Maqbool, U., Ahmad, M., Anwar, U., Haq, H., & Iqbal, M. M. (2004). Determination of aflatoxin-B_1 in poultry feed and its components employing enzyme linked immunosorbent assay (ELISA). *Toxicological and Environmental Chemistry,* 86, 213–218.

Marmot, M. (2002). The influence of income on health: Views of an epidemiologist. *Health Affairs,* 21, 31-46.

Martins, M. L., & Martins, H. M. (2000). Aflatoxin M_1 in raw and ultra high temperature-treated milk commercialized in Portugal. *Food Additives and Contaminants: Part A,* 17,871-874.

Masoero, F., Gallo, A., Diaz, D., Piva, G., & Moschini, M. (2009). Effects of the procedure of inclusion of a sequenstering agent in the total mixed ration on proportional aflatoxin M_1 excretion into milk of lactating dairy cows. *Animal*

Feed Science and Technology, Vol. 150, Iss: 1-2, pp. 34-45. Doi: 10.1016/j.anifeedsci.2008.07.009

Mason, S., Hajimohammadi, B., Ehrampoush, M. H., Khabiri, F., & Soltani, M. (2015). A survey on relationship between diet and urinary excretion of aflatoxin M_1 : A screening pilot study on Iranian population. *Journal of Food Quality and Hazards Control,* 2, 66–70.

McDaniels, T. L., Kamlet, M. S., & Fischer, G.W. (1992). Risk perception and the value of safety. *Risk Analysis,* 12, 495–503.

Meucci, V., Razzuoli, E., Soldani, G., & Massart, F. (2010). Mycotoxin detection in infant formula milks in Italy. *Food Additives and Contaminants: Part A,* 27,64-71.

Meyerowitz, B. E., & Chaiken, S. (1987). The effect of message framing on breast self-examination attitudes, intentions, and behavior. *Journal of Personality and Social Psychology,* 52, 500–510.

Michalski, M., & Januel, C. (2006). Does homogenation affect the human health and properties in cow's milk? *Trends in Food Science and Technology,* 17, 423–427.

Milosavljevic, D., Mandic, M. L., & Banjari, I. (2015). Nutritional knowledge and dietary habits survey in high school population. *Collegium Antropologicum*, 39 (1), 101–107.

Mohamadi Sani, A., Nikpooyan, H., & Moshiri, R. (2010). Aflatoxin M_1 contamination and antibiotic residue in milk in Khorasan province, Iran. *Food and Chemical Toxicology, Vol. 48, Iss: 8-9,* pp. 2130–2132. Doi: 10.1016/j.fct.2010.05.015

Montagna, M.T., Napoli, C., De Giglio, O., Iatta, R., & Barbuti, G. (2008). Occurrence of aflatoxin M_1 in dairy products in southern Italy. *International Journal of Molecular Science,* 9, 2614–2621.

Motawee, M., Meyer, M., & Bauer, J. (2004).Occurrence of aflatoxin M_1 and B_1 in milk and some milk products in Mansoura, Egypt. *Mansoura University Journal of Agricultural Science,* 29(2), 719–725.

Muhammd, K., Tipu, M. Y., Abbas, M., & Khan, A. M. (2010). Monitoring of aflatoxin M_1 in market raw milk in Lahore City , Pakistan. *Pakistan Journal of Zoology,* 42(6), 697–700.

Mykkänen, H., Zhu, H., Salminen, E., Juvonen, R. O., Ling, W., & Ma, J. (2005). Fecal and urinary excretion of aflatoxin B_1 metabolites (AFQ_1, AFM_1, and AFB-N7-guanine) in young Chinese males. *International Journal of Cancer, Vol. 115,* pp. 879–884. Doi: 10.1002/ijc.20951

Newell, D. G., Koopmans, M., Verhoef, L., Duizer, E., Aidara-kane, A., Sprong, H., & Kruse, H. (2010). International Journal of Food Microbiology Food-borne

diseases -The challenges of 20 years ago still persist while new ones continue to emerge. *International Journal of Food Microbiology, Vol. 139,* pp. 3–15. Doi:10.1016/j.ijfoodmicro.2010.01.021

Nikbakht Nasrabadi, E., Jamaluddin, R., Abdul Mutalib, M. S., Khaza'ai, H., Khalesi, S., & Mohd Redzwan, S. (2013). Reduction of aflatoxin level in aflatoxin-induced rats by the activity of probiotic Lactobacillus casei strain Shirota. *Journal of Applied Microbiology, Vol. 114, Iss:* 5, pp. 1507–15. Doi: 10.1111/jam.12148

Norimah, A. K., Safiah, M. Y., Jamal, K., Siti Haslinda, M. D., Zuhaida, H., Rohida, S., Fatimah, S., Siti Norazlin, Poh, B. K., Kandiah, M., Zalilah, M. S., Wan Mana, W. M., Fatimah, S., & Azmi, M. Y. (2008). Food consumption patterns: findings from the Malaysian Adult Nutrition Survey (MANS). *Malaysian Journal Nutrition,* 14(1): 25-39.

Nuryono, N., Agus, a., Wedhastri, S., Maryudani, Y. B., Sigit Setyabudi, F. M. C., Böhm, J., & Razzazi-Fazeli, E. (2009). A limited survey of aflatoxin M_1 in milk from Indonesia by ELISA. *Food Control, Vol. 20,* Iss: 8, pp. 721–724. Doi: 10.1016/j.foodcont.2008.09.005

Nyathi, C. B., Mutiro, C. F., Hasler, J. A., & Chetsanga, C. J. (1987). A survey of urinary aflatoxin in Zimbabwe. *International Journal of Epidemiology,* 16(4), 516–519.

Oliveira, C. A.F., Germano, P. M. L., Bird, C., & Pinto, C. A. (1997). Immunochemical assessment of aflatoxin M_1 in milk powder consumed by infants in São Paulo, Brazil. *Food Additives and Contaminants,* 14(1), 7–10.

Oliveira, C. A. F., & Ferraz, J. C. O. (2007). Occurrence of aflatoxin M_1 in pasteurised, UHT milk and milk powder from goat origin. *Food Control, Vol. 18,* pp. 375–378. Doi: 10.1016/j.foodcont.2005.11.003

Oliveira, C. P. de., Soares, N. de. F. F., Oliveira, T. V. de., Baffa Júnior, J. C., & Silva, W. A. da. (2013). Aflatoxin M_1 occurrence in ultra high temperature (UHT) treated fluid milk from Minas Gerais/Brazil. *Food Control,* 30(1), 90–92.

O'Riordan, M. J., & Wilkinson, M. G. (2008). A survey of the incidence and level of aflatoxin contamination in a range of imported spice preparations on the Irish retail market. *Food Chemistry,* 107, 1429–1435.

Oruc, H. H., Cibik, R., Yilmaz, E., & Kalkanli, O. (2006). Distribution and stability of Aflatoxin M_1 during processing and ripening of traditional white pickled cheese. *Food Additives and Contaminants,* 23, 190-195.

Osaili, T.M., Obeidat, B. A., Jomous, D. O. A., & Bawadi, H. A. (2011). Food safety knowledge and practices among female college students in north Jordan. *Food Control,* 22, 269-276.

Oveisi, M. R., Jannat, B., Sadeghi, N., Hajimahmoodi, M., & Nikzad, A. (2006). Presence of aflatoxin M_1 in milk and infant milk products in Tehran, Iran. *Food Control*, 18, 1216–1218.

Paterson, R. R. M., & Lima, N. (2010). "Toxicology of mycotoxins," in Molecular, Clinical and Environmental Toxicology. In A. Luch (Eds.), *Clinical Toxicology*, Vol. 2 (pp. 31-63). Birkhauser Verlag, Switzerland.

Pei, S. C., Zhang, Y. Y., Eremin, S. A., & Lee, W. J. (2009). Detection of aflatoxin M_1 in milk products from China by ELISA using monoclonal antibodies. *Food Control, Vol. 20, Iss:* 12, pp. 1080–1085. Doi: 10.1016/j.foodcont.2009.02.004

Perera, F. (1987) The potential usefulness of biological markers in risk assessment. *Environmental Health Perspective,* 76, 141–145.

Picinin, L. C. A., Cerqueira, M. M. O. P., Vargas, E. A., Lana, A.M. O., Toaldo, I.M., & Bordignon Luiz, M. T. (2013). Influence of climate conditions on aflatoxin M_1 contamination in raw milk from Minas Gerais State, Brazil. *Food Control*, 31, 419-424.

Pier, A. C., McLoughlin, M. E., Richard, J. L., Baetz, A., & Dahfren, R. R. (1985). In utero transfer of aflatoxin and selected effects in neonatal pigs. In Lacey. J (Eds.), *Trichothecenes and other mycotoxins* (pp. 495–506). Wiley, New York.

Polychronaki, N., Wild, C. P., Mykka, H., Abdel-wahhab, M., Sylla, A., Diallo, M., & Turner, P. C. (2008). Urinary biomarkers of aflatoxin exposure in young children from Egypt and Guinea. *Food Chemical and Toxicology, Vol. 46,* pp. 519–526. Doi: 10.1016/j.fct.2007.08.034

Prado, G., Oliveira, M. S., Abrantes, F. M., Santos, L. G., Soares, C. R., & Veloso, T. (1999). Occurrence of aflatoxin M_1 in milk consumed in Minas Gerais / Brazil. *Science and Food Technology*, 19 (3).

Prado, G., Oliveira, M. S., Pereira, M. L., Abrantes , F. M., Santos, L. L., & Veloso, T. (2000). Aflatoxin M_1 in samples of "Minas" cheese commercialized in the city f Belo Horizonte - Minas Gerais, Brazil. *Science and Food Technology, Campinas*, 20(3), 398-400.

Prado, G.,Oliveira, M. S. De, Lima, A. S., & Moreira, A. P. A. (2008). Occurrence of aflatoxin M_1 in parmesan cheese consumed in Minas Gerais, Brazil. *Ciência E Agrotecnologia, Vol. 32,* pp. 1906–1911. Doi: 10.1590/S1413-70542008000600033

Prandini, A., Tansini, G., Sigolo, S., Filippi, L., Laporta, M., & Piva, G. (2009). On the occurrence of aflatoxin M_1 in milk and dairy products. *Food and Chemical Toxicology,* 47(5), 984-991.

Qian, G., Ross, R. K., Yu, M. C., Yuan, J., Gao, Y., Henderson, B. E. & Groopman, J. D. (1994). A follow-up study of urinary markers of aflatoxin liver cancer

risk in Shanghai people's republic exposure and of China. *Cancer Epidemiology, Biomarkers and Prevention,* 3, 3–10.

Rahimi, E., Bonyadian, M., Rafei, M., & Kazemeini, H. R. (2010). Occurrence of aflatoxin M_1 in raw milk of five dairy species in Ahvaz, Iran. *Food and Chemical Toxicology : An International Journal Published for the British Industrial Biological Research Association, Vol. 48, Iss: 1,* pp. 129–31. Doi: 10.1016/j.fct.2009.09.028

Rastogi, S., Dwivedi, P. D., Khanna, S. K., & Das, M. (2004). Detection of Aflatoxin M_1 contamination in milk and infant milk products from Indian markets by ELISA. *Food Control, Vol. 15, Iss: 4,* pp. 287–290. Doi: 10.1016/S0956-7135(03)00078-1

Reddy, K. R. N., Reddy, C. S., & Muralidharan, K. (2009). Potential of botanicals and biocontrol agents on growth and aflatoxin production by Aspergillus flavus infecting rice grains. *Food Control*, 20, 173–178.

Reddy, K. R. N., Farhana, N. I., & Salleh, B. (2011). Occurrence of Aspergillus spp. and aflatoxin B_1 in Malaysian foods used for human consumption. *Journal of Food Science, Vol. 76, Iss: 4,* pp. 99–104. Doi: 10.1111/j.1750-3841.2011.02133.x

Redzwan, M. S., Rosita, J., Mohd Sokhini, A.M., & Nurul 'Aqilah, A.R. (2012a). Socio-demographic and socio-economic determinants of adults' knowledge on fungal and aflatoxin contamination in the diets. *Asian Pacific Journal of Tropical Biomedicine*, 2 (3), 1835-1841.

Redzwan, M. S., Rosita, J., Mohd Sokhini, A.M., & Nurul 'Aqilah, A.R. (2012b). Association between aflatoxin M_1 excreted in human urine samples with the consumption of milk and dairy products. *Bulletin of Environmental Contamination and Toxicology*, 89, 1115-1119.

Redzwan, M. S., Rosita, J., Mohd Sokhini, A.M., & Zuraini, A. (2013). A mini review on aflatoxin exposure in Malaysia: past, present and future. *Frontier in Microbiology*, 4 (334), 1-8.

Rodricks, J. V., & Stoloff, L. (1977). Aflatoxin residues from contaminated feed in edible tissues of food-producing animals. In Rodricks, J. V. C., Hesseltine, W., & Mehlman, M. A (Eds.). *Mycotoxins in human and animal health* (pp. 67-69). Park Forest South, Ill.: Patholox Publishers.

Romero, A. de. C., Ferreira, T. R. B., Dias, C. T. dos S., Calori Domingues, M. A., & da Gloria, E. M. (2010). Occurrence of AFM1 in urine samples of a Brazilian population and association with food consumption. *Food Control*, 21 (4), 554–558.

Roussi, V., Govaris, A., Varagouli, A., & Botsoglu, N.A. (2002). Occurrence of aflatoxin M_1 in raw and market milk commercialized in Greece. *Food Additive and Contaminant*, 19, 863-868.

Ruangwises, N., & Ruangwises, S. (2010). Aflatoxin M_1 Contamination in Raw Milk within the Central Region of Thailand. *Bulletin of Environmental Contamination and Toxicology*, 85, 195-198.

Ruangwises, N., Saipan, P., & Ruangwises, S. (2011). Estimated daily intake of aflatoxin M_1 in Thailand. In R. G. Guevara-Gonzalez (Ed.). Aflatoxins Biochemistry and Molecular Biology (pp. 439–446). InTech, Rijeka, Croati.

Ruagwises, S., & Saipan, P. (2013). Occurrence of aflatoxin M_1 in raw and pasteurized goat milk in Thailand. *InTech*, pp. 207-219. Doi: 10.5772/52723

Rustom, I. Y. S. (1997). Aflatoxin in food and feed: Occurence, legislation and inactivation by physical methods. *Food Chemistry*, 59, 57-67.

Sabran,M. R., Jamaluddin, R., & Abdul Mutalib, M. S. (2012). Screening of aflatoxin M_1, a metabolite of aflatoxin B_1 in human urine samples in Malaysia: A preliminary study. *Food Control*, 28, 55-58.

Sadia, A., Jabbar, M. A., Deng, J., Hussain, E. A., Riffat, S., & Naveed, S. (2012). A survey of aflatoxin M_1 in milk and sweets of Punjab, Pakistan. *Food Control*, 26, 235-240.

Safiah, M. Y., Siti, H. M. D., & Ahmad, M. R. (2003a). Habitual Food Intake of Adults Aged 18 to 59 Years, *Malaysian Adult Nutritional Survey, Vol. 7*. Nutrition Section, Family Health Development Ministry of Health Malaysia.

Safiah, M. Y., Siti, H. M. D., & Ahmad, M. R. (2003b). Methodology, *Malaysian Adult Nutritional Survey, Vol. 1*. Nutrition Section, Family Health Development Ministry of Health Malaysia.

Salem, N. M., & Ahmad, R. (2010). Mycotoxins in food from Jordan: preliminary survey. *Food Control*, 21, 1099–1103.

Sanchez Villegas, A., Martínez, J. A., Prättälä, R., Toledo, E., Roos' G., & Martínez González, M. A. (2003). A systematic review of socioeconomic differences in food habits in Europe: consumption of cheese and milk *European Journal of Clinical Nutrition, Vol. 57*, pp. 917–929. Doi: 10.1038/sj.ejcn.1601626

Santos, L., Marín, S., Mateo, E. M., Gil-Serna, J., Valle-Algarra, F. M., Patiño, B., & Ramos, A. J. (2011). Mycobiota and cooccurrence of mycotoxins in Capsicum powder. *International Journal of Food Microbiology, Vol. 151, Iss: 3*, pp. 270–276. Doi: 10.1016/j.ijfoodmicro.2011.09.011

Scaglioni, P. T., Becker-algeri, T., Drunkler, D., & Badiale-furlong, E. (2014). Aflatoxin B_1 and M_1 in milk. *Analytica Chimica Acta, Vol. 829*, pp. 68–74. Doi: 10.1016/j.aca.2014.04.036

Schade, J. E., McGreevy, K., King, a D., Mackey, B., & Fuller, G. (1975). Incidence of aflatoxin in California almonds. *Applied Microbiology*, 29(1), 48–53.

Schwartzbord, J. R., & Brown, D. L. (2015). Aflatoxin contamination in Haitian peanut products and maize and the safety of oil processed from contaminated peanuts. *Food Control*, Vol. *56*, pp. 114–118. Doi: 10.1016/j.foodcont.2015.03.014

Serbian Regulation (2013). Maximum allowed contents of contaminants in food and feed. *Official Bulletin of the Republic of Serbia,* 20 (13), 1.

Shankardass, K., Lofters, A., Kirts, M., & Quinonez, C. (2012). Public awareness of income-related health inequalities in Ontario, Canada. *International Journal Equity in Health,* 11, 26.

Shundo, L., & Sabino, M. (2006). Aflatoxin M_1 in milk by immunoaffinity column cleanup with TLC/HPLC determination. *Brazilian Journal of Microbiology*, 37, 164–167.

Shundo, L., Navas, S. A., Lamardo, L. C. A., Ruvieri, V., & Sabino, M. (2009). Estimate of aflatoxin M_1 exposure in milk and occurrence in Brazil. *Food Control*, 20, 655-657.

Škrbić, B., Živančev, J., Antić, I., & Godula, M. (2014). Levels of aflatoxin M_1 in different types of milk collected in Serbia: Assessment of human and animal exposure. *Food Control, Vol. 40,* pp. 113–119. Doi: 10.1016/j.foodcont.2013.11.039

Sobel, M. E. (1982). Asymptotic Confidence Intervals for Indirect Effects in Structural Equation Models. Sociological Methodology, *Vol.* 13, pp. 290–312. Doi: 10.2307/270723

Soleimany, F., Jinap, S., & Abas, F. (2012). Determination of mycotoxins in cereals by liquid chromatography tandem mass spectrometry. *Food Chemistry*, *Vol. 130*, pp. 1055–1060. Doi: 10.1016/j.foodchem.2011.07.131

Srivastava, V. P., Bu-Abbas. A., Alla-Basuny Al-Johar, W., Al-Mufti, S., & Siddiqui, K. J. (2001). Aflatoxin M_1 contamination in commercial samples of milk and dairy products in Kuwait. *Food Addictives and Contaminant,* 18, 993-997.

Stoloff, L. (1980). Aflatoxin M1 in perspective. *Journal of Food Protection,* 43,226–230.

Subar, A. F. (2004). Developing Dietary Assessement Tools. *Journal of the American Dietetic Association,* 104 (5), 769-700.

Suliman, S. E., & Abdalla, M. A. (2013). Presence of aflatoxin M_1 in dairy cattle milk in Khartoum State-Sudan. *International Journal of Scientific and Technology Research*, 2(4), 10–12.

Sun, Z., Lu, P., Gail, M.H., Pee, D., Zhang, Q., Ming, L., Wang, J., Wu, Y., Liu, G., & Zhu, Y. (1999). Increased risk of hepatocellular carcinoma in male

hepatitis B surface antigen carriers with chronic hepatitis who have detectable urinary aflatoxin metabolite M_1. *Hepatology,* 30, 379–383.

Suzana, S., Noor Aini, M. Y., Nik Shanita, S., Rafidah, G., & Roslina, A. (2009). *Atlas of Food Exchanges and Portion Sizes (2nd ed.).* Kuala Lumpur : MDC Publishers.

Sylos, C. M., Rodriguez Amaya, D. B., Carvalho, P. R. N. (1996). Occurrence of aflatoxin M_1 in milk and dairy products industrialized in Campinas, Brazil. *Food Additives and Contaminant,* 13, 169- 172.

Tekinsen, K. K., & Tekinsen, O. C. (2005). Aflatoxin M_1 in white pickle and Van otlu (herb) cheeses consumed in southeastern Turkey. *Food Control,* 16, 565-568

Tekinsen, K. K., & Eken, H. S. (2008a). Aflatoxin M_1 levels in UHT milk and Kashar cheese consumed in Turkey. *Food and Chemical Toxicology,* 46, 3287-3289.

Tekinsen, K. K., & Ucar, G. (2008b). Aflatoxins M_1 in butter and cream cheese consumed in Turkey. *Food Control, Vol. 19,* pp. 27-30. Doi: 10.1016/j.foodcont.2007.01.003

Temamogullari, F., & Kanici, A. (2014). Short communication: Aflatoxin M_1 in dairy products sold in Şanlıurfa, Turkey. *Journal of Dairy Science, Vol. 97, Iss: 1,* pp. 162–5. Doi: 10.3168/jds.2012-6184

Thanaboripat D. (2005) Mycotoxins: *Occurrence and Control in Foods.* Bangkok, Thailand: Foodtech International. Sovereign Publications Limited.

Thomas, A. Arcury., & Eric H. C. (1993). Rural-Urban Differences in Environmental Knowledge and Actions *The Journal of Environmental Education Vol. 25, Iss: 1,* pp. 19-25. Doi: 10.1080/00958964

Toh, P. S., & Birchenough, A. (2000). Food safety knowledge and attitudes: cultural and environmental impact on hawkers in Malaysia knowledge and attitudes are key attribute of concern in hawker food handling practices and outbreaks of food poisoning and their preventions. *Food Control,* 11, 447-452.

Trucksess, M. W., & Page, S. W. (1986). Examination of imported cheese for aflatoxin M_1. *Journal of Food Protection,* 49, 632-633.

Tsakiris, I. N., Tzatzarakis, M. N., Alegakis, A. K., Vlachou, M. I., Renieri, E. A., & Tsatsakis, A. M. (2013). Risk assessment scenarios of children's exposure to aflatoxin M_1 residues in different milk types from the Greek market. *Food and Chemical Toxicology,* Vol. *56,* pp. 261–265. Doi: 10.1016/j.fct.2013.02.024

Tucker, K., Spiro Avron, III., & Weiss, S. T. (1995). Variation in food and nutrient intakes among older men: Age, and other socio-demographic factors. *Nutrition Research*, 15(2), 161–176.

Turkish Food Codex. (2008). Communiqué on determining the maximum levels of certain contaminants in foodstuffs. *Official Journal Number,* 26879, 3-4.

Unusan, N. (2006). Occurrence of aflatoxin M_1 in UHT milk in Turkey. *Food and Chemical Toxicology,* 44, 1897–1900.

Unusan, N. (2007). Consumer food safety knowledge and practices in the home in Turkey. *Food Control, Vol. 18,* pp. 45–51. Doi: 10.1016/j.foodcont.2005.08.006

US FDA, US Food and Drug Administration. (1996). Sec. 527.400 whole milk, low fat milk, skim milk–aflatoxin M1 (CPG 7106.210). FDA compliance policy guides. DC: FDA, Washington. p. 219.

Velasco, M. L. R., Delso, M. M. C., & Escudero, D. O. (2003). ELISA and HPLC determination of the occurrence of aflatoxin M_1 in raw cow's milk. *Food Additives and Contaminants,* 20, 276-280.

Wang, J. S., hen, X., He, X., Zhu, Y. R., Zhang, B. C., & Wang, J. B. (1999). Protective alteration in Phase 1 and 2 metabolism of aflatoxin B_1 by oltipraz in residents of Qidong, People's Republic of China. *Journal of National Cancer Institute, Vol. 91,* pp. 347–354. Doi: 10.1093/jnci/91.4.347

Wang, J. S., Huang, T., Su, J., Liang, F., Wei, Z., Liang, Y., Luo, H., Kuang, S.Y., Qian, G.S., & Sun, G. (2001). Hepatocellular carcinoma and aflatoxin exposure in Zhuqing Village, Fusui County, People's Republic of China. *Cancer Epidemiology, Biomarkers and Preventaion,* 10, 143–146

Wang, J., & Liu, X. M. (2007). Contamination of aflatoxins in different kinds of foods in China. *Biomedical and Environmental Sciences : BES*, 20, 483–487.

Williams, J. H., Phillips, T. D., Jolly, P. E., Stiles, J. K., Jolly, C. M., & Aggarwal, D. (2004). Human aflatoxicosis in developing countries: A review of toxicology, exposure, potential health consequences, and interventions. *American Journal Clinical Nutrition,* 80, 1106-1122.

Yousef, A.., & Marth, E.H. (1989). Stability and degradation of aflatoxin M_1. In: Van Egmond, H.P. (Ed.), *Mycotoxins in Dairy Products* (pp. 127–161). London: Elsevier Applied Science.

Zeluta, A., Maurizi, A., Frigola, A., Esteve, M. J., Coli, R., & Burini, G. (2009). Antioxidant capacity of cow milk, whey and deproteinized milk. *International Dairy Journal,* 19, 380-385.

Zheng, N., Sun, P.,Wang, J. Q., Zhen, Y. P., Han, R.W., & Xu, X. M. (2013). Occurrence of aflatoxin M_1 in UHT milk and pasteurized milk in China market. *Food Control, 29,*198-201.

Zhu, J. Q., Zhang, L. S., Hu, X., Xiao, Y., Chen, J. S., & Xu, Y. C. (1987). Correlation of dietary aflatoxin B1 levels with excretion of aflatoxin M_1 in human urine. *Cancer Research,* 47, 1848–1852.

Zinedine, A., González-Osnaya, L., Soriano, J. M., Moltó, J. C., Idrissi, L., & Man ˇes, J. (2007). Presence of aflatoxin M_1 in pasteurized milk from Morocco. *International Journal of Food Microbiology*, 114, 25–29.

Zulhabri, O., Jamal, R., Ia., M. R., Harjit, S., & Wang Ngah, W. Z. (2009). Hotspot Ser-249 TP53 mutations, aflatoxin B_1-adducts and hepatitis B infection in human hepatocellular carcinoma from Malaysia. *Medical Journal of Malaysia*, 64, 88.

Zainal Ariffin, O., & Nor Saleha, I. T. (2011).National Cancer Registy Report 2007. Malaysia Cancer Statistics-Data and Figure. Putrajaya: National Cancer Registry, Ministry of Health Malaysia.

LIST OF PUBLICATIONS

Oral and poster presentations

Farah Nadira A., Rosita J., & Norhaizan M. E. (2015). Screening of aflatoxin M_1 occurrence in selected milk and dairy products in Kuala Terengganu, Terengganu, Malaysia. Nutrition Society of Malaysia 30th Annual Scientific Conference 2 – 3 June 2015 at Renaissance Hotel, Kuala Lumpur, Malaysia (pp. 128).

Farah Nadira A., Rosita J., & Norhaizan M. E. (2016). Screening of aflatoxin M_1 metabolite in urine samples among residents in Terengganu, Malaysia. Nutrition Society of Malaysia 31th Annual Scientific Conference 31 May - 1 June 2016 at Istana Hotel, Kuala Lumpur, Malaysia (pp.62).

Journal

Farah Nadira A., Rosita J., Norhaizan M. E., & Mohd Redzwan S. (2016). Screening of aflatoxin M1 occurrence in selected milk and dairy products in Terengganu, Malaysia. *Food Control*, pp. 1-6. Doi: 10.1016/j.foodcont.2016.08.004

UNIVERSITI PUTRA MALAYSIA

STATUS CONFIRMATION FOR THESIS / PROJECT REPORT AND COPYRIGHT

ACADEMIC SESSION : _____

TITLE OF THESIS / PROJECT REPORT :

OCCURRENCE OF AFLATOXIN M_1 IN URINE SAMPLES, MILK AND DAIRY PRODUCTS AND THEIR ASSOCIATED FACTORS AMONG RESIDENTS IN TERENGGANU, MALAYSIA

NAME OF STUDENT: FARAH NADIRA BINTI AHMAD

I acknowledge that the copyright and other intellectual property in the thesis/project report belonged to Universiti Putra Malaysia and I agree to allow this thesis/project report to be placed at the library under the following terms:

1. This thesis/project report is the property of Universiti Putra Malaysia.
2. The library of Universiti Putra Malaysia has the right to make copies for educational purposes only.
3. The library of Universiti Putra Malaysia is allowed to make copies of this thesis for academic exchange.

I declare that this thesis is classified as :

*Please tick (√)

☐	**CONFIDENTIAL**	(Contain confidential information under Official Secret Act 1972).
☐	**RESTRICTED**	(Contains restricted information as specified by the organization/institution where research was done).
☐	**OPEN ACCESS**	I agree that my thesis/project report to be published as hard copy or online open access.

This thesis is submitted for :

☐	**PATENT**	Embargo from _____ (date) until _____ (date)

Approved by:

_____	_____
(Signature of Student)	(Signature of Chairman of Supervisory Committee)
New IC No/ Passport No.:	Name:
Date :	Date :

[Note : If the thesis is CONFIDENTIAL or RESTRICTED, please attach with the letter from the organization/institution with period and reasons for confidentially or restricted.]