



UNIVERSITI PUTRA MALAYSIA

***MILK COMPOSITIONS OF DAIRY COWS WITH CLINICAL AND
SUBCLINICAL INTRAMAMMARY INFECTIONS***

IDA AMALINA BINTI MAHADI

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D.V.M.

2016



IDA AMALINA BINTI MAHADI

FACULTY OF VETERINARY MEDICINE

UNIVERSITI PUTRA MALAYSIA

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2016

**MILK COMPOSITIONS OF DAIRY COWS WITH CLINICAL AND
SUBCLINICAL INTRAMAMMARY INFECTIONS**

IDA AMALINA BINTI MAHADI

A project paper submitted to the
Faculty of Veterinary Medicine, Universiti Putra Malaysia

In partial fulfilment of the requirement for the
DEGREE OF DOCTOR OF VETERINARY MEDICINE

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CERTIFICATION

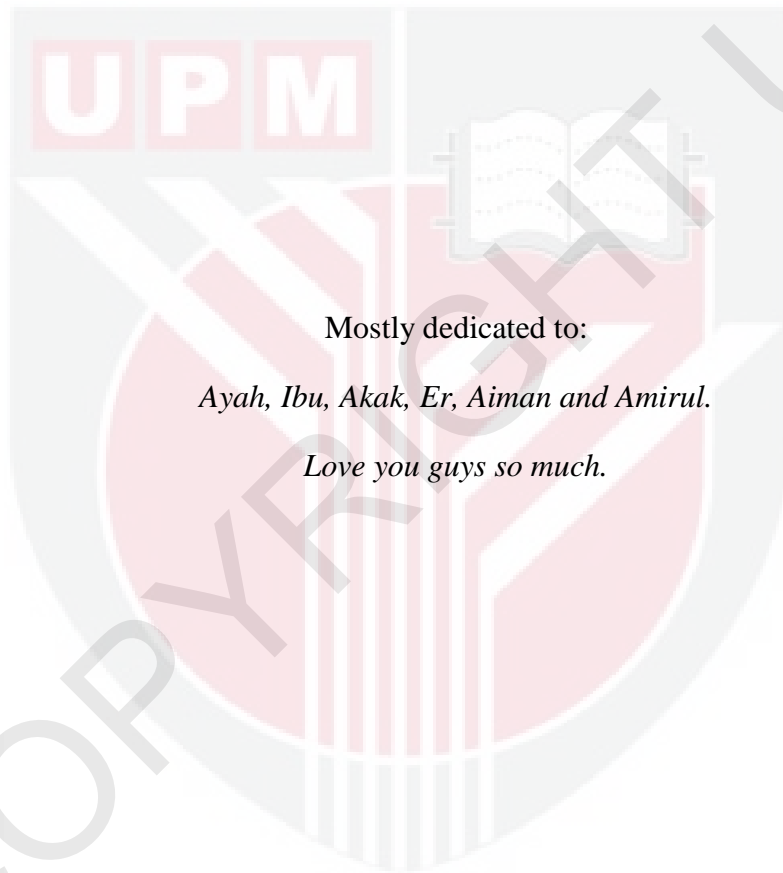
It is hereby certified that we have read this project paper entitled “Milk Compositions of Dairy Cows with Clinical and Subclinical Intramammary Infections”, by Ida Amalina Binti Mahadi and in our opinion it is satisfactory in terms of scope, quality, and presentation as partial fulfilment of the requirement for the course VPD 4999 - Project.

DR. ROZAIHAN MANSOR
DVM (UPM), Ph.D (Glasgow)
Senior Lecturer,
Faculty of Veterinary Medicine
Universiti Putra Malaysia,
Serdang, Selangor
(Supervisor)

PROF. DR. ABDUL AZIZ SAHAREE
B.V.Sc. & A.H (Bombay), B.V.Sc. (Melbourne), M.Sc. (Edinburgh), Ph.D
(UPM)
Professor,
Faculty of Veterinary Medicine
Universiti Putra Malaysia
(Co-Supervisor)

DEDICATIONS

In the name of Allah, The Most Benevolent, The Most Merciful



Mostly dedicated to:

Ayah, Ibu, Akak, Er, Aiman and Amirul.

Love you guys so much.

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LIST OF ABBREVIATIONS

UPM	=	Universiti Putra Malaysia
FPV	=	Faculty of Veterinary Medicine
UVH	=	University Veterinary Hospital
TPU	=	Taman Pertanian Universiti
IMI	=	Intramammary Infections
CMT	=	California Mastitis Test
SCC	=	Somatic Cell Counts
SNF	=	Soli non-fat
FFA	=	Free fatty acids
%	=	Percentage
<i>et al.</i>	=	et al. (abbr. Latin) et alii (and others)

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ABSTRAK

Abstrak daripada projek yang dikemukakan kepada Fakulti Perubatan Veterinar untuk memenuhi sebahagian daripada keperluan kursus VPD 4999 – Projek

KOMPOSISI-KOMPOSISI SUSU LEMBU TENUSU DENGAN JANGKITAN INTRAMAMMARI KLINIKAL DAN SUBKLINIKAL

Oleh

Ida Amalina Binti Mahadi

2016

Penyelia: Dr. Rozaihan Mansor

Penyelia Bersama: Prof. Dr. Abdul Aziz Saharee

Pengeluaran dan kualiti susu boleh merosot dengan jangkitan intramammari (IMI) yang menyebabkan perubahan komposisi-komposisi susu. Kajian ini dijalankan untuk menentukan perubahan dalam parameter komposisi-komposisi susu dan untuk mengaitkan hubungan antara bilangan sel somatik (SCC) dan parameter komposisi-komposisi susu lembu tenusu dengan jangkitan intramammari dan tanpa jangkitan intramammari. Sebanyak 20 ekor lembu tenusu dari Taman Pertanian Universiti (TPU) dan Ladang Angkat (*Foster Farms*) dimasukkan di dalam kajian ini. Ujian California Mastitis (CMT) telah digunakan untuk mengenal pasti jangkitan

inramammari subklinikal dalam lembu tenusu (n=10) manakala lembu tenusu yang sihat (n=10) telah digunakan sebagai kawalan negatif berdasarkan keputusan CMT (negatif, surih) tanpa tanda-tanda jangkitan intramammari klinikal. Malangnya, tidak ada kes jangkitan intramammari klinikal ditemui dalam kajian ini. SCC dan parameter komposisi-komposisi susu (susu lemak, protein, kasein, laktosa, jumlah pepejal, pepejal bukan lemak (SNF), asid lemak bebas (FFA), dan keasidan) telah ditentukan dan kasein, laktosa, SNF dan SCC ditemui akan berbeza dengan ketara antara kawalan dan kumpulan jangkitan intramammari subklinikal. Kasein, laktosa dan SNF juga didapati negatif dikaitkan dengan SCC. Kesimpulannya, perubahan ketara dalam parameter komposisi-komposisi susu boleh ditemui di dalam susu lembu tenusu dengan jangkitan intramammari subklinikal yang seterusnya menjejaskan kualiti susu.

Kata kunci: Jangkitan Intramammari (IMI), parameter komposisi susu, bilangan sel somatik (SCC), Ujian California Mastitis (CMT), kualiti susu.

ABSTRACT

An abstract from the project paper presented to the Faculty of Veterinary Medicine
in the partial fulfilment of course VPD 4999 – Project

MILK COMPOSITIONS OF DAIRY COWS WITH CLINICAL AND SUBCLINICAL INTRAMAMMARY INFECTIONS

By

Ida Amalina Binti Mahadi

2016

Supervisor: Dr. Rozaihan Mansor

Co-Supervisor: Prof. Dr. Abdul Aziz Saharee

The production and quality of milk can deteriorate by intramammary infections resulting in milk compositions alteration. This study was done to determine the changes in the milk composition parameters and to correlate the relationship between somatic cell counts (SCC) and milk composition parameters of dairy cows with and without IMI. A total of 20 dairy cows from Taman Pertanian Universiti (TPU) and *Ladang Angkat* (Foster Farms) were included in this study. The California Mastitis Test (CMT) was used to identify subclinical IMI in dairy cows (n=10) while healthy dairy cows (n=10) were used as the negative control based on

CMT results (negative, trace) with no clinical signs of IMI. However, no clinical IMI case was found in this study. The SCC and the milk compositions parameters (milk fat, protein, casein, lactose, total solid, solid non-fat (SNF), free fatty acids (FFA), and acidity) were determined and casein, lactose, SNF and SCC were found to be significantly different between control and subclinical IMI groups. Furthermore, casein, lactose and SNF were also found negatively correlated with the SCC. In conclusion, significant changes in milk compositions parameter can be found in milk of dairy cows with subclinical IMI which consequently affect milk quality.

Keywords: Intramammary infections (IMI), milk composition parameter, somatic cell counts (SCC), California Mastitis Test (CMT), milk quality.

1.0 INTRODUCTION

1.1 Background of the study

Milk which is also known as the secretion produced by animal's mammary gland especially cows, buffaloes, goats and sheep used for human consumption in a variety range of dairy products worldwide (Walstra *et al.*, 2006). Malaysia relies heavily on importation to satisfy domestic demand for dairy products. The dairy product import value had increased from RM69 million in 1970 to RM1.2 billion in 2014. Although the milk production has increased over the past decades, Malaysia is still unable to meet the demand (Rachel & Chubashini, 2015). Between 1990 & 2005, consumption of fresh whole milk increased by 33% from 32.9kg/capita to 43.5kg/capita (Boniface & Umberger, 2012). The increasing awareness on nutritional benefits coupled with increasing preference on dairy products has contributed to increase demand of dairy product in Malaysia. Therefore, the rising demand has driven the government to formulate policies and suggest steps to meet the need (Rachel & Chubashini, 2015).

The production and quality of milk can be influenced by various factors such as disease occurrence namely intramammary infections (IMI) or mastitis (Payne and Wilson, 1999). The IMI will not only cause an adverse effects on the quality of milk by decreasing the synthetic capacity of mammary gland such as decreased synthesis of casein and lactose (summarized by Urech *et al.*, 1999; Auldism & Hubble, 1998; Pyörälä, 2003; and Akers, 2002) but it also caused the damaged mammary tissue to be increased in vascular permeability. As a result, milk composition is altered due to leakage of blood constituents, serum protein

enzymes, and salts into the milk (Østerås, 2000; Harmon, 1994). There are several challenges faced by the Malaysia's dairy sector such as lack of skills and training, low breed performance and inadaptability, poor dairy farm management and inadequate nutritious feed, high input and feed costs (Rachel & Chubashini, 2015).

IMI is the most prevalent disease in dairy cattle which raised an economically concerned that is responsible for major losses in dairy industry especially subclinical form IMI (Tomazi *et al.*, 2015). Subclinical form IMI does not cause visible changes in the milk or the udder but it decreases the production and alters the milk compositions with the presence of bacteria in the secretion. It also results in an influx of inflammatory cells (somatic cell) which often detected based on increase of SCC in the milk (Ruegg and Erskine, 2014).

Clinical form of IMI is often characterized by abnormal milk secretion (presence of clots, flakes or blood) which may be accompanied with or without abnormalities in the mammary gland (hard, pain or swelling of the cow's udder) or systemic signs such as lethargy or anorexia and increased in rectal temperature and these would aid in the diagnosis of IMI (Harmon, 1994; Sandholm *et al.*, 1995; Pinzón-Sánchez & Ruegg, 2011; and Ruegg & Erskine, 2014).

The IMI causative agents can be categorized into minor or major pathogens (Eberhart *et al.*, 1987; Harmon *et al.*, 1986; Hogan *et al.*, 1987; and Schalm *et al.*, 1971). Major pathogens such as *Staphylococcus aureus*, *Streptococci (agalactiae, dysgalactiae, uberis)*, *Escherichia coli* and *Klebsiella* spp are the most common causative agent which causes clinical form IMI (Djabri *et al.*, 2002; Nielsen, 2009) and give extensive changes to the milk compositions (Harmon, 1994). Coagulase-negative staphylococci and *Corynebacterium bovis* are considered as minor

pathogens causing only moderate infection and most often associated with subclinical form IMI (Djabri *et al.*, 2002; Harmon, 1994).

1.2 Overall Objectives of the study

1. To determine the changes in the milk compositions parameter of dairy cows with clinical and subclinical intramammary infections (IMI).
2. To correlate the relationship between somatic cell counts (SCC) and milk compositions parameter in the milk of dairy cows.

1.3 Justifications of the study

1. The clinical and subclinical intramammary infections may alter the milk composition by changing the quality and hygienic value of milk.
2. The clinical and subclinical intramammary infections should be identified at an early stage as to maintain the milk quality and productivity of dairy industry.
3. There is a high demand of milk yield and milk quality in dairy cows, thus preventative measures is essential to avoid negative consequences of clinical and subclinical intramammary infections that may lead to economic losses to producers and health problems to consumers due to antimicrobial residue present in the milk.

1.4 Hypotheses of the study

Ho: There is no significant difference in the milk composition parameters between healthy dairy cows and infected dairy cows with clinical and subclinical IMI.

Ha: There is significant difference in the milk composition parameters between healthy dairy cows and infected dairy cows with clinical and subclinical IMI.

Ho: There is no correlation between SCC and the milk composition parameters in the milk of dairy cows with and without IMI.

Ha: There is correlation between SCC and the milk composition parameters in the milk of dairy cows with and without IMI.

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