Cairo University
Faculty of Veterinary Medicine
Dept. of Biochemistry and Chemistry of Nutrition

Molecular studies on some genes related to seasonal reproductive variation in sheep

Presented by

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For the master degree
In Veterinary Medical Sciences
(Biochemistry and Chemistry of Nutrition)

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Abstract

This study was carried out for detection of polymorphisms in melatonin receptor 1A (MTNR1A) and Arylalkylamine N acetyltransferase (AA-NAT) genes and their association with reproductive traits. Blood samples of 126 Animal from three Egyptian sheep breeds were collected. DNA was extracted and subjected to PCR-RFLP using RsaI and SmaI enzymes. Two alleles (C and T), three genotypes (CC, CT and TT) for MTNR1A gene also (A and G), (GG, GA, and AA) for AA-NAT gene were detected. Alleles C and A, genotypes CT and GA showed the highest frequency for MTNR1A and AA-NAT genes respectively. Association analysis of MTNR1A SNP revealed a significant association in Ossimi and Rhmani breeds with age of first lambing and C allele seems to be the favorable allele. Results for AA-NAT SNP demonstrate significant differences in Ossimi with age of first lambing and litter size and in Rhmani with lambing interval and Quite discrepancy were observed for the favorable allele. Concerning to first conception season the study revealed that ewes carrying CT genotype of MTNR1A gene and conceive in UF season exhibited significantly the lowest age of first lambing and TT ewes conceived in LF have the highest litter size. Also, ewes carrying GG genotype of AA-NAT gene and conceive in EF or UF seasons exhibited significantly the lowest age of first lambing. Regarding lambing season TT ewes of MTNR1A SNP with lambing period in LF season and GG ewes of AA-NAT SNP with lambing period in UF season have significantly the lowest lambing interval. According to personal knowledge this is the first study concerned with this association in Egyptian sheep breed. In conclusion: the polymorphisms achieved in this study could be measured as genetic markers suitable for improving reproductive efficiency during unfavorable season and the obtained desirable genotypes could be taken into account in new genetic selective schemes.

Keywords: (MTNR1A, AA-NAT, Egyptian sheep, polymorphism, Reproductive seasonality, PCR-RFLP).

Dedication

I dedicate this thesis to my mother Wafaa who have always been a constant source of support and encouragement during the challenges of my whole life, my father Ali, my Sister Asmaa and my brother Mohamed whom I'm truly grateful for having them in my life. This work is also dedicated to my lovely husband Khaled, who have always loved me unconditionally and encourage me to work hard for the things that I aspire to achieve and to my little pretty angle Dai the smile that lightens my way.

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Contents

LIST OF TABLES

Page

LIST OF FIGURES

Page

Page

Page

Page

INTRODUCTION

Sheep is considered as an important farm animal and contribute significantly to livelihood of a human population. They are multipurpose animal, have lower feed requirement, shorter generation intervals, small size, and are better able to utilize a wide range of feedstuffs (**Devendra, 2002 and Morris, 2009)**. Rahmani, Ossimi, and Barki, are of the main sheep breeds in Egypt. They are raised mainly for meat with carpet wool as a secondary product and milk is of very minor importance **(Galal *et al.*, 2005)**.

Sheep are widely known as an animal with marked seasonality of breeding activity **(Rosa and Bryant 2003)**. The photoperiod drives their reproductive cycle, which comprises a season of high sexual activity during short days and an anestrous season that occurs during long days **(Saxena *et al.*, 2015)[a]**.

Seasonal variation in fertility is a major obstacle to increase the intensity of sheep production. Satisfactory reproductive performance is mainly limited by the need to lengthen the breeding season to encompass unfavorable breeding seasons. The identification of quantitative trait loci (QTL) and the implementation of marker-assisted selection could assist in selection schemes to shorten the seasonal anestrus and improve reproductive performance **(Notter and Cockett, 2005)**.