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**Al-Quds University**



**Prevalence and Molecular Typing of Methicillin Resistant  
*Staphylococcus aureus* among Veterinary Doctors in  
Palestine**

**Rozan Romel Fawzi Attili**

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Prevalence and Molecular Typing of Methicillin Resistant  
*Staphylococcus aureus* among Veterinary Doctors in Palestine

Prepared by:  
Roza Romel Fawzi Attali

Supervisor: Dr. Hatem Eideh

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### Thesis Approval

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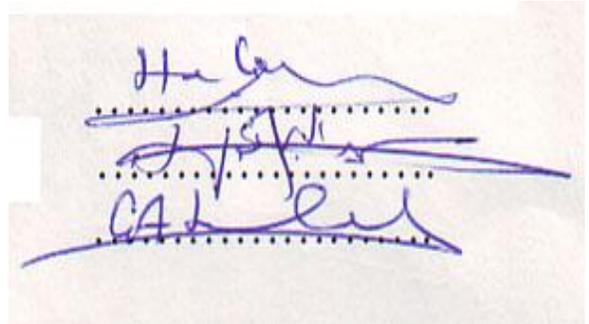
Prepared by: Rozan Romel Fawzi Attili  
Registration number: 0920231

Supervisor: Dr. Hatem Eideh

Master thesis submitted and accepted, Date: Tuesday 8.01.2013

The names and signatures of the examining committee members are as follows:

- 1-Head of committee: Dr. Hatem Eideh
- 2-Internal Examiner: Dr. Sameer Barghouthi
- 3-External Examiner: Dr. Gabi Abu-Sada



Jerusalem-Palestine

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## **Declaration**

I certify that this thesis submitted for the degree of Master in Medical Laboratory Sciences is the result of my own research, except where otherwise acknowledged, and that this study (or any part of the same) has not been submitted to any for a higher degree to any other university or institution.

Signed:

Rozan Romel Fawzi Attili

Date: 8.01.2013

## **Dedications**

To my Father Romel Attili my mother Wejdan, my brother Fawzi, my two sisters Fatima and Lilian. To my Husband Adnan Fayyad and my son Yazan.

A great thank for your support.

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## **Abbreviations and Definitions**

**CA-MRSA** Community-associated methicillin-resistant *Staphylococcus aureus*

**CDC** Centers for Disease Control and Prevention

**CLSI** Clinical Laboratory Standards Institute

**g** Grams

**HA-MRSA** Hospital-Associated Methicillin-Resistant *Staphylococcus aureus*

**l** Litre

**Kb** Kilo base

**mg** Milligram

**MIC** Minimum Inhibitory Concentration

**mL** Milliliter

**MRSA** Methicillin-resistant *Staphylococcus aureus*

**MSA** Mannitol Salt Agar

**NHLS** National Health Laboratory Service

**PFGE** Pulsed-Field Gel Electrophoresis

**UPGMA** Unweighted-Pair Group Matching Analysis

## Abstract

**Objectives** Methicillin-resistant *Staphylococcus aureus* (MRSA) is a major public health problem due to its multiple antibiotic resistance properties. Recently the emergence of MRSA have been described and investigated in animals. Through this study we aim to determine the prevalence of MRSA among Palestinian veterinary doctors, determine the molecular characteristics of these MRSA isolates and evaluate the risk of nasal MRSA carriage among those with direct contact with livestock. **Methods** Nasal swabs were obtained from 200 subjects including veterinary students and doctors from An-Najah National university and veterinary doctors working at the Ministry of Agriculture. at (). Data regarding animal exposure, information about professional contact and known MRSA risk factors were obtained from participants by designed questionnaire. Participants were screened for MRSA by standard microbiological techniques. Molecular analysis was done using Pulse Field Gel Electrophoresis (PFGE) in order to characterize the *S. aureus* isolates. **Results:** Nasal carriage of *S. aureus* was found in 28 of 200 specimens (14%) of which MRSA accounted for 4% (8 isolates). All 28 strains of *S. aureus* were sensitive to vancomycin.

MRSA resistances to other antibiotics used in this study were as follows: 89.2% to erythromycin, 100% to ampicillin, 28.5% to Oxicillin, 14% to chloramphenicol, 39.2% to gentamycin. Four major types of PFGE patterns were identified (A, B, C and D) among MRSA strains. Three predominant PFGE types were recognized, Type A (37.5%). Type B (33.8%) and Type C (33.8%). One isolate with a unique PFGE pattern Type D (12.5%) was identified as a different clone.

**Conclusions** MRSA colonization may be an occupational risk for veterinary professionals. As MRSA spread among community, changes in its epidemiology are certain. The micro flora of

humans and animals, are closely intertwined. MRSA is now a pathogen of domestic animals that can be transmitted between animals and humans. Accordingly, further scrutiny of the roles of animals in MRSA infection and colonization is required. The effect of routine contact with household pets on the global epidemiology of MRSA is still unknown.

**Key terms** Antibiotic Resistance; MRSA; Veterinary Doctors.

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## Chapter One

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### INTRODUCTION

*Staphylococcus aureus* is a Gram-positive, coagulase positive coccus, non-motile, non-spore forming bacteria. The golden appearance of this bacterium on blood agar is the etymological root of the bacteria's specific name as *aureus* means "gold" in Latin (Lowy, 1998). *Staphylococcus aureus* has been commonly noted to occur as a commensal organism, which usually exists without likely harmful effects, on the body surface or in the nasal passages of healthy humans and animals. Under certain conditions, such as weakness to immune system or injury to skin surfaces, a commensal organism may become opportunistic and be capable to causing infection. Clinical signs of infection in humans may range from light skin infections (pimples, boils and impetigo), to much more serious conditions such as post-operative wound infections and cellulites. *S. aureus* may also cause bacteremia, sepsis, meningitis and pneumonia (Kluytmans et al., 1997).

In addition to human colonization by *S. aureus*, the organism can colonize many other animals, including horses, cats, birds, dogs, pigs, cattle and chickens (Weese. 2005). Antibiotics have been the first line of defense in treating clinical infection in both man and animals. Bacteria that are resistant to antibiotic treatment are a public health concern.

During the past four decades, many strains of *S. aureus* have been evolved from controllable problem into a serious public health concern since they have become Methicillin-Resistant (David et al., 2010). The resistant bacteria produced penicillinase, an enzyme that breaks down

penicillin. By 1961 the first case of MRSA infection was reported in England (Jevons et al., 1961). Methicillin-Resistant *Staphylococcus aureus* (MRSA) strains are now prevalent worldwide in both human and veterinary medicine (Barber , 1990).

The rapid spread of bacteria resistant to antimicrobials, although it is a global phenomenon, is seen to be higher in developing countries attributed mainly to misuse of antibiotics including use of prophylaxis (Palavecino, 2004).

MRSA is a major cause of hospital-acquired infections worldwide (Jarvis et al. 2006), that's why MRSA must be recognized now as one of the most common causes of infections acquired in the community (Graham et al., 2006). Transmission of MRSA from animals to staff tending to these animals appears to be an international problem, creating a new reservoir for community-acquired MRSA (CA-MRSA) in humans (Seguin et al., 1999).

The rise of a new zoonotic source of MRSA could have a severe impact on the epidemiology of CA-MRSA, and may have effects for the control of MRSA, especially in those countries that maintain a low prevalence by means of search and destroy policies (Lee, 2003).

The objectives of this study were to evaluate the prevalence of MRSA among veterinary doctors in Palestine, and to determine the molecular characteristics of MRSA isolates by Pulsed-Field Gel Electrophoresis.

## **Aims and Objectives**

1. To evaluate the prevalence and molecular characteristics of (MRSA) among veterinary doctors and to estimate the impact of animal reservoir on human healthcare.
2. To investigate if those in professional contact (veterinary doctors) with livestock are at higher risk for (MRSA) nasal carriage.