



**The performance of Strep B Carrot Broth™
Versus Latex Agglutination Test for Rapid
Detection of Group B Streptococcus
Colonization Status and its Prevalence in
Near- Term Pregnant Women**

Thesis

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List of Abbreviations

Abb.	Meaning
ACOG	American College of Obstetricians and Gynecologists
Api	Analytical profile index
CAMP	Christie, Atkins, and Munch-Peterson
CDC	Centers for Diseases Control
CNA	Colistin-nalidixic acid agar
ELISA	Enzyme linked immune sorbent assay
EOGBS	Early onset GBS
EOS.....	Early-onset sepsis
GAPDH	Glyceraldehyde3 phosphate dehydrogenase
GBS	Group B Strepto Coccus
GBS.EOD	Group B Streptococcus Early-onset disease
GBS.LOD	Group B Streptococcus Late-onset disease
1AP	Intrapartum antibiotic prophylaxis
LAT	Latex agglutination tests
LM1C	Low- and middle-income countries
LOS.....	Late onset disease
MALDI-TOF MS..	matrix assisted laser desorption ionization-time of flight mass spectrometry

List of Abbreviations

Abb.	Meaning
NAAT	Nucleic acid amplification technique
NAD	Nicotine adenine dinucleotide
NADP	Nicotine adenine dinucleotide phosphate
NAMRU.....	Naval Medical Research Unit
N1CE	National Institute of Health Care and Excellence
NNA	Neomycin-nalidixic acid agar
PCR.....	Polymerase chain reaction
PROM.....	premature rupture of membranes
PTS	phosphoenolpyruvate-dependent phosphotransferase system
RCOG	Royal College of Obstetricians and Gynaecologists
SCB.....	Strept Carrot Broth
SDS PAGE.....	Sodium dodecyl sulphate / polyacrylamide gel electrophoresis
TCAtri.....	Carboxylic acid cycle
THB	Todd Hewitt Broth

WHO WORLD HEALTH ORGANIZATION

of Rapid Detection Test for Latex Agglutination and its Colonization Status *Streptococcus* B Group Pregnant Women Term -in Near Prevalence

Abstract

Background: Group B Streptococcus (GBS) has been described as one of the commonest causes of the early onset of sepsis among the newborns, which leads to high rate of mortality and morbidity. Centers for Diseases Control (CDC) (2016) recommended GBS screening for all pregnant women between 35 and 37 weeks of pregnancy, **Objectives:** This work aims for evaluation of Strep B carrot broth (SCB) versus Latex agglutination technique (LA) as a screening method for early detection of Group B Streptococci colonizing the genital tract of pregnant females **Methodology:** the present study was conducted on 100 pregnant women attending the antenatal care clinic of Maternity Hospitals, Faculty of Medicine, Ain shams University. Duplicate vaginal swabs were taken, one for detection of GBS by Strep B Carrot Broth (SBC) and the second swab for detection of GBS by latex agglutination test. **Results:** The prevalence of GBS was 33% by SCB. SCB had excellent performance compared to LA test, with a sensitivity of 90.9%, specificity of 100%, and negative predictive value (NPV) and positive predictive value (PPV) of 95.7% and 100%, respectively. **Conclusion:** We can use SCB for rapid and reliable GBS screening in pregnancy as it has less false positive results in comparison to other conventional methods. Antepartum GBS screening is highly recommended to reduce the emerging antibiotic resistance among GBS strains.

Keywords: ACOG.. American College of Obstetricians and Gynecologists;
NADP: Nicotine adenine dinucleotide phosphate

INTRODUCTION

Group B *Streptococcus* (GBS) has been one of the common causes of the early onset of sepsis among the newborns, which leads to high rate of morbidity and mortality (*Ipolito et al., 2010*). The primary risk factor for neonatal GBS infection is the maternal colonization with the organism. This is also the basis of preventive strategies in western countries (*Khatoon et al., 2016*).

In addition, GBS is one of the main causes of infection in pregnant women with chorioamnionitis, endometritis, genitourinary tract and surgical wound infection. Genital infection is responsible for almost one-third of preterm deliveries, and GBS produce protease activity resulting to cervical ripening (*Shirazi et al., 2014*).

Most women infected by GBS are asymptomatic, and the organism can be found from their throat, vagina and rectum (*Edmond et al., 2012*). According to a report by World Health Organization (WHO), the prevalence of GBS colonization in pregnant women is about 5-40% in different countries. Among infected women, 50% showed GBS colonization in their vagina, while the rest revealed infection in their rectum and throat. However, the prevalence of colonization differs based on the age, parity, race, concurrent vaginal yeast colonization, genetic-ethnic factors, socio-economic status, pork consumption and recent sexual intercourse (*Park et al., 2013*).

However in developing countries like Egypt the problem has not been adequately studied and there are only a few studies available

GBS colonization of the maternal genital tract is related to early onset neonatal sepsis, as a result of vertical transmission before or during labor (**Barcaite et al., 2012**). The rate of vertical transmission of GBS between mothers and their offspring is about 29-85% (mean=51%). This transmission to some extent depends on factors including the severity of maternal colonization in birth canal. The rate of GBS infection in the newborn of colonized mother who has not received antibiotic during delivery is one out of 200, and in cases of receiving antibiotic, it is one out of 4000. In the presence of other predisposing factors like prematurity, maternal fever, premature rupture of membranes (PROM) more than 18 hours, low birth weight and multi parity, the infection rate increases (**Edmond et al., 2012**).

In the USA, the two major prevention strategies for GBS disease include the screening method and the risk-based approach. Pregnant women carrying GBS are offered to take intrapartum antibiotic prophylaxis (**Jahed et al., 2011**).

The Centers for Diseases Control (CDC) recommended GBS screening for all pregnant women between 35 and 37 weeks of pregnancy, as well as taking intrapartum antibiotic prophylaxis (**Yang et al., 2012**), so

Pregnant women with unknown GBS status should be treated with antibiotic at the time of delivery (**Edmond et al., 2012**).

Group B Streptococci has a variety of virulence factors that facilitate its ability to cause disease. Several virulence determinants are involved in the adhesion to and invasion of host cells, as well as in evasion from the immune system (**Dutra et al., 2014**).

Virulence factors include capsular polysaccharides, regulatory proteins, surface-localized proteins, and toxins. GBS makes use of a number of virulence factors, including pore-forming toxins that damage host cells, adhesion factors that increase binding to cells or to the extracellular matrix, evasion factors that decrease neutrophil recruitment and prevent complement binding, and factors that repel or otherwise induce resistance to antimicrobial peptides (**Chen et al., 2013**).

AIM OF THE WORK

The aim of the present study was to detect the performance of strep B carrot Broth TM versus Latex agglutination test for Rapid Detection of Group B *Streptococcus* Colonization Status and it's Prevalence in Near- Term Pregnant Women attending ante-natal clinic and emergency room in Ain Shams University Maternity hospital.

Chapter One

STREPTOCOCCUS AGALACTIAE

I. Morphology:

Streptococcus agalactiae also known as group B streptococcus (GBS), is a Gram-positive encapsulated bacterium that belongs to the group of pyogenic streptococci. It is the only *Streptococcus* species harboring the Lancefield group B cell-wall-specific polysaccharide antigen that is common to all GBS strains. GBS can be subdivided into 10 different serotypes (1a, 1b, and 11 to 1X) on the basis of type-specific capsular polysaccharides (*Edwards et al., 2016*).

Streptococcus is a genus that is classified based on the hemolytic properties into three types: Alpha-Hemolytic Streptococci, Beta-Hemolytic Streptococci, and Non-Hemolytic Streptococci (*Ibrahim et al., 2017*).



Figure (1): Group B Streptococci are Gram positive cocci in pairs and short chains on Gram stain (*Spellerberg et al., 2015*).

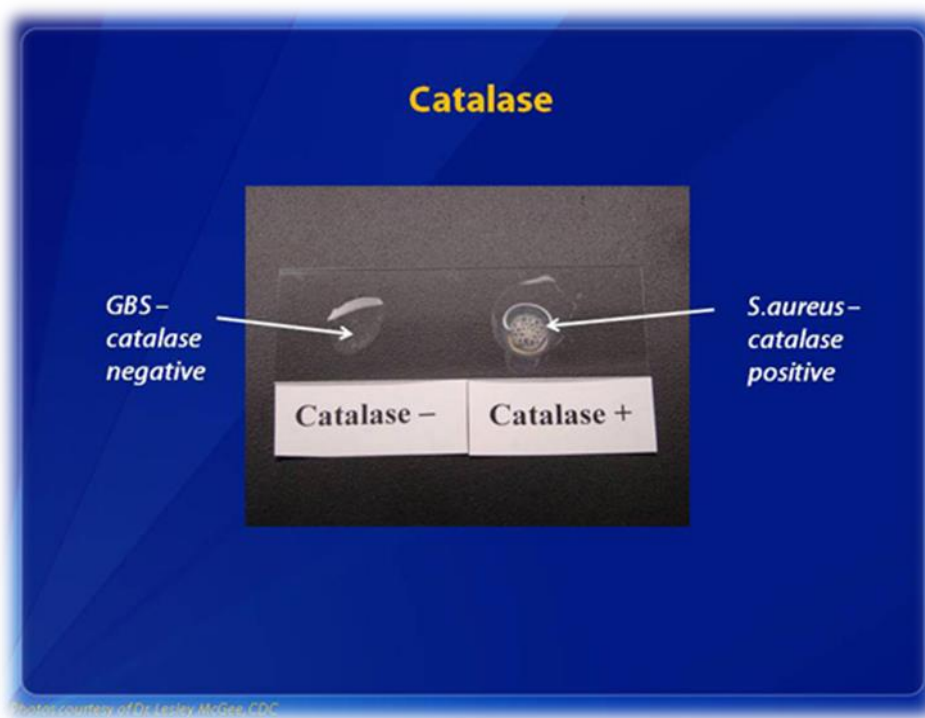


Figure (2): Group B *Streptococcus* (GBS) isolates are catalase negative (*Capanna et al., 2013*).

Streptococcus agalactiae is one of four Beta-Hemolytic streptococci, which results in complete rupture of blood cells shown in wide and clear areas surrounding bacterial colonies on blood agar (*Moreno et al., 2014*). The species name "*agalactiae*" meaning "no milk", alludes to this (*Johri et al., 2006*).



Figure (3): Beta-hemolytic *Streptococcus agalactiae* (Group B Strep.) on 5% Sheep Blood Agar (*Spellerberg et al., 2015*).

II. Habitat:

GBS is a harmless commensal bacterium being part of The human microbiota colonizing the gastrointestinal and genitourinary tracts of up to 30% of healthy human adults (**asymptomatic carriers**) (*Patras et al., 2018*).

The gastrointestinal and genital tract are commonly colonized by GBS in 10–40% of healthy adults but remain asymptomatic. The gastrointestinal tract serves as the primary reservoir for GBS and is the likely source of vaginal colonization (*Melin and Efstratiou, 2013*).