Role of platelet Pan Genera Detection (PGD) Test as rapid screening test for detection of bacterial contamination of single donor platelets concentrates

Thesis Submitted for Partial Fulfillment of master Degree in Clinical Pathology.

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بسم الله الرحمن الرحيم

((قالوا سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم))

صدق الله العظيم

Declaration

This thesis has not been previously submitted for a degree at this or at any other university and is the original work of the writer.

Mahmoud Yehya Sleem Ahmed

Dedication

I would like to dedicate this work to my family and my colleagues for their encouragement, putting up with me and supporting me through all this work.

Many thanks to all of them

Mahmoud Yehya Sleem

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Mahmoud yehya Sleem

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LIST OF ABBREVIATIONS

ADP…….Adenosine **D**iphosphate

AIDS..……..Acquired **I**mmune **D**eficiency **S**yndrome

APCs……Apheresis **P**latelet **C**oncentrates

BC…….Buffy **C**oat

BSA……...Body **S**urface **A**rea

CAD…….....Coronary **A**rtery **D**isease

CCI……Corrected platelet **C**ount **I**ncrement

COX……..Cyclo **-Ox**ygenase

CVA……..Cerebro **V**ascular **A**ccident

DIC……Disseminated **I**ntravascular **C**oagulopathy

DNA……..Deoxyribo **N**ucleic **A**cid

ECV……..Extra **C**orporeal **V**olume

FDA……..Food and **D**rug **A**ssociation

HBsAg ……....Hepatitis **B** Surface **A**ntigen

HCV…….Hepatitis **C V**irus

HELLP……Hemolytic **A**nemia**,E**levated **L**iver enzymes**, L**ow Platelet count

HIV……..Human **I**mmunodeficiency **V**irus

HIT……...Heparin-**I**nduced **T**hrombocytopenia

HLA…….....Human **L**eucocyte **A**ntigen

LPS…….....Lipopolysaccharide

LTA……..Lipoteichoic acid

LRAP……...Leucocyte **R**educed **A**pheresis **P**latelet**.**

MI…….Myocardial **I**nfarction

NSAID……..Non **S**teroidal **A**nti **I**nflammatory **D**rugs

PAOD……...Peripheral **A**rtery **O**cclusive **D**isease

PDGF……Platelet **D**erived **G**rowth **F**actor

PGD……..Pan **G**enera **D**etection

PGI2…….Prostaglandin **I2**

PPCs…….Pooled buffy coat **P**latelet **C**oncentrates

PRP……...Platelet **R**ich **P**lasma

RBCs…….Red **B**lood **C**ells

SDPs…….Single **D**onor **P**latelets

TABC……...Transfusion **A**ssociated **B**acterial **C**ontanination

TGF……..Tissue **G**rowth **F**actor

TTP……...Thrombotic **T**hrombocytopenic **P**urpura

TXA2……Thromboxane **A2**

UVA…….....Ultra **V**iolet ray **A**

VWF…….....Von **-W**illebrand **F**actor

ABSTREACT

Abstract

Bacterial contamination of platelet products, both single donor apheresis platelet units and whole blood-derived platelet pools, continues to occur despite preventive measures. While some advances have been made in decreasing the rate of bacterial contamination of platelet units, particularly through diversion methods and early culture, a great deal remains to be done to eliminate the problem. Diversion methods have decreased contamination rates associated with skin commensal organisms.

In this study10 single donor platelet units were collected from eligible platelet donors using the standard collection procedures of Blood Transfusion Center of Cairo University hospitals. Units were examined for bacterial contamination at days (0 , 5 , 7) of collection Using our new method platelet pan genera detection (PGD) test and bacterial culture as a comparative method. All examined units were negative for bacterial contamination up to day 7 according to results revealed by both platelet (PGD)test and bacterial culture. This means that we can extend shelf life of platelet units up to 7 days instead of 5 days and units can be examined for bacterial contamination immediately before transfusion to insure safety of transfused units.

Key Words :

Platelets PGO test – Bacterial - Contamination .

INTRODUCTION
AND
AIM OF WORK

Introduction and aim of the work

Platelet storage conditions promote the proliferation of bacteria rendering even minor contamination at the time of collection potentially lethal after 5 – 7 days of storage. Sources of product contamination include skin flora mobilized as the needle is inserted, asymptomatic bacteremia in the donor and environmental contamination during manufacture and storage. The introduction of sterile, closed collection systems, donor health screening, improved skin preparation techniques, initial sample diversion strategies, product inspection, and most recently bacterial culture of products at the blood centre of screening at the time of issue have all contributed to limiting and/or detecting contamination and to improving platelet safety. Bacterial concentrations in contaminated platelet units are very low at the time of collection and may not be reliably detectable by available test methods in samples drawn at that time. During component storage this initial small inoculum of bacteria may grow, but by consequence of the diverse interactions of bacteria, donor unit and environmental conditions, the onset and rate of growth is highly unpredictable. Because of this variability, QC testing for bacterial contamination at a later phase of component storage may serve to maximize the ability to identify contaminated platelet units compared to testing only at an early phase of storage **(R.J. Benjamen, 2008).**

A novel Pan Genera Detection (PGD) technology has been developed that detects the presence of conserved antigens lipoteichoic acid (LTA) and lipopolysaccharide (LPS) found on aerobic and anaerobic GP and GN bacteria, respectively. LTA and LPS targets are located on the surface of their respective bacteria and are primary constituents of the cell wall(**Fischer.,1988,Rietschel et al.,1996)** LTA and LPS antigens can