EFFECT OF STORAGE ON BLOOD COMPONENTS IN BANK BLOOD

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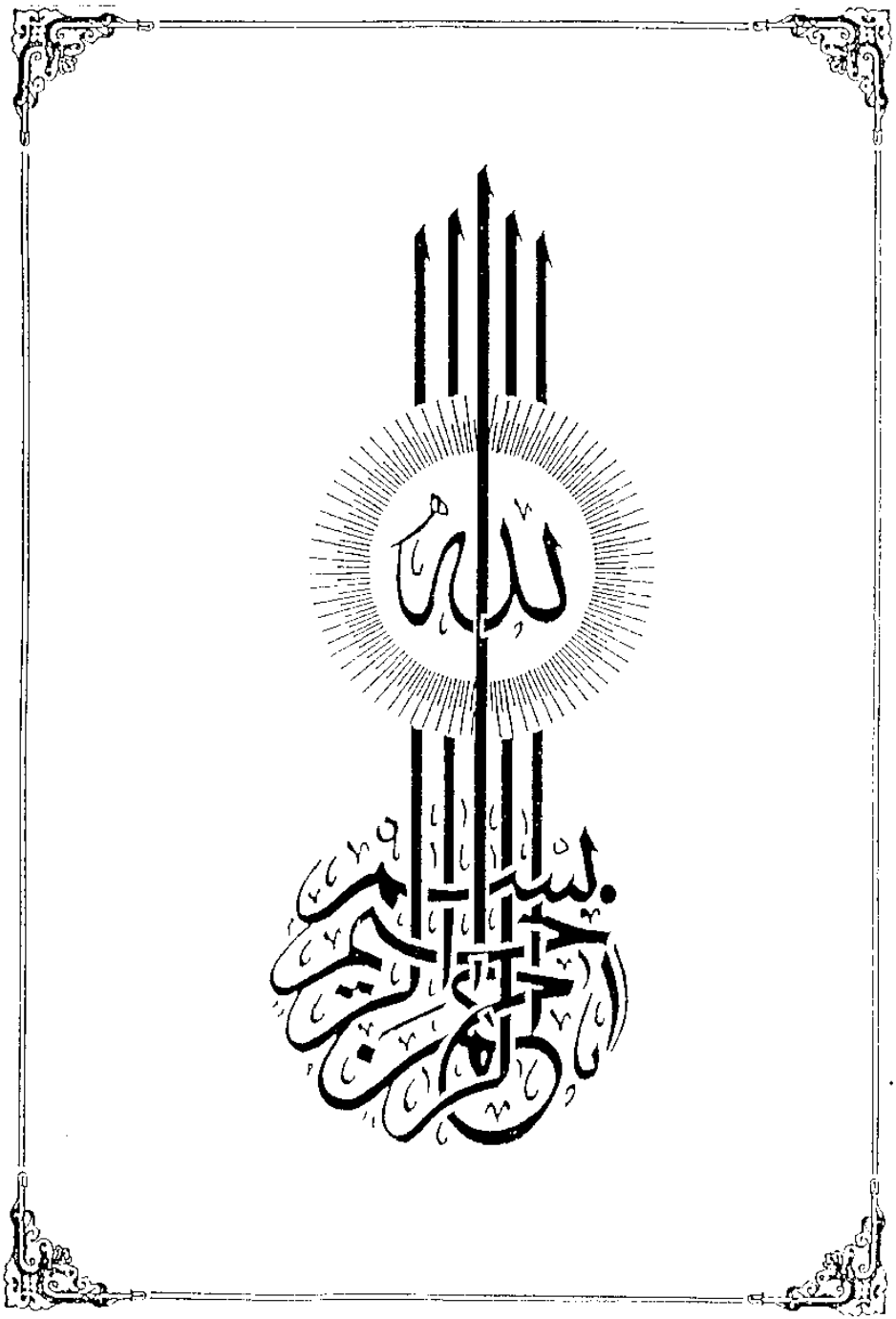

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ARABIC SUMMARY

ABBREVIATIONS

AA	:	Arachidonic acid.
ACD	:	Acid citrate dextrose.
ADP	:	Adenosine diphosphate.
AIDS	:	Acquired immune deficiency syndrome.
AMP	:	Adenosine monophosphate.
ATP	:	Adenosine triphosphate.
Ca^{2}	:	Calcium.
CML	:	Chronic myelogenous leukaemia.
CPD	:	Citrate phosphate dextrose.
CPD-A	:	Citrate phosphate dextrose-adenine.
DIC	:	Disseminated intravascular coagulation.
DMSO	:	Dimethylsulfoxide.
DPG	:	Diphosphoglycerate.
F. V	:	Factor V.
F.VIII	:	Factor VIII.
FFP	:	Fresh-frozen plasma.
GDP	:	Guanosine diphosphate.
GPIb	:	Glycoprotein Ib.
GPIIb	:	Glycoprotein IIb.
GTP	:	guanosine triphosphate.
GVHD	:	Graft versus host disease.

Hete : 12-L-hydroxy-5,8,10,14-eicosatetraynoic acid.

HPL : High pressure liquid chromatography.

MP : Membranous microparticles.

MPV : Mean platelet volume.

OAS : Optimal additive solution.

PCs : Platelet concentrates.

PF_3 : Platelet factor 3.

PI : Phosphatidylinositol.

PLS : Phospholipids.

PMN : Polymorphnuclear (Granulocytes).

PPF : Plasma protein fraction.

RBCs : Red blood cells.

RCC : Red cell concentrate.

SAG-M : Saline adenosine glucose mannitol.

TXA_2 : Thromboxane A_2.

vWF : von Willebrand's factor.

Introduction And Aim Of The Work

INTRODUCTION

The blood bank no longer supplies only whole blood, but rather provides a variety of blood components tailored to specific patient needs.

Discussion of the metabolic problems potentially associated with large volume transfusion must begin with an understanding of the alternation occuring in blood upon storage.

Red blood cell membrane gradually loses its functional integrity with passage of time, and the cell becomes increasingly fragile, sodium leaks into the cell and potassium escapes. Also, a decrease in the formation of spectrin actin complex was noted in the absence or presence of protein 4,1. Formation of the actin spectrin protein 4,1 complex fall linearly during storage (Wolfe et al., 1986).

Several investigators have demonstrated a physical or immunological decrease in GPIb during storage of platelet concentrates which is important in platelet adhesion (Bode et al., 1990). Platelets also become insensitive to

aggregating agents, suggesting damage to some platelet pathways of platelet activation (Cesar and Navarro, 1990).

Moreover, the granulocytes survival under storage conditions is shorter and they begin to loose their most highly integrative function, i.e. chemotaxis, (Lane and Lamkin, 1988a).

AIM OF THE WORK

The aim of this work is to throw light on the changes, that occur in blood components upon storage in blood banks.

Review Of Literature

STORAGE OF BLOOD AND THE ANTICOAGULANT PRESERVATIVE SOLUTIONS

The prime consideration in blood storage is to establish and maintain conditions allowing transfusion of erythrocytes that will survive and function normally after infusion into the recipient. The preservation of other components- fibrinogen, platelets, or antihaemophilic factor, for example is also important, but erythrocyte preservation is central to all aspects of blood storage and is the area of most concern in the evaluation of blood preservation.

There is a critical relationship between glucose metabolism, ATP production, and the energy needed for erythrocyte viability.

Preservation of blood must be done in a way that will provide adequate amounts of glucose for conversion to ATP "energy", and conditions that interfere with or inhibit this glycolytic pathway will be deleterious to red cell survival during or after blood storage (Card et al., 1983).

The anticoagulant-preservative solutions in current use all have large amounts of availabl glucose to provide the required starting material for this energy production, in addition, they contain chemicals that inhibit or prevent clotting of the blood (Mollison, 1984 and Peck, 1984).

ANTICOAGULANTS AND SOLUTIONS FOR RED CELL PRESERVATION

(A) Heparin:

Heparin can be used as an anticoagulant, but it lacks the ability to support red cell metabolism. Red cells stored in heparin rapidly exhibit ATP depletion and the other manifestations of the storage lesion, with consequent diminished post-transfusion viability. On storage, heparin is gradually broken down and the blood clots as the anticoagulant effect of heparin may be neutralized in part by heparin inhibitory factors and by thromboplastic materials released from cellular elements of stored blood, so

heparinized blood therefore must be used within 48 hours of collection (Tector, 1976).

In the past, heparinized blood was used to prime extra-corporeal circuits to avoid hypocalcemia caused by citrate anticoagulants, currently, the use of non-blood-containing volume expanders is preferred. For the same reason, heparinized blood has been used in exchange transfusion of neonates, but the problem has been minimized with the use of concentrated red cells (Mollison et al., 1987).

(B) Acid Citrate Dextrose Solution:

Acid citrate dextrose (ACD) solution was introduced as the standard preservative solution for blood during the second world war. Citrate provides anticoagulation, dextrose provides energy for synthesis of phosphate compounds (DPG and ATP), and acid reduces the lysis of red cells and subsequent leakage of K^+. The pH of the solution is approximately 5.0, and after admixture the pH of the blood is 6.9-7.0. As ACD is hypotonic the cells swell and have increased

osmotic fragility. The shelf life for ACD blood is 21 days, it has now been replaced by citrate phosphate dextrose (CPD) and is only used in automated plasmapheresis of donors (Hoffbrand and Lewis, 1989).

(C) Citrate Phosphate Dextrose Solution:

The constituents of citrate phosphate dextrose (CPD) are shown in table (1). CPD contains relatively less citric acid than ACD. It is isotonic, and has a pH of 5.6 (pH after mixing with blood is 7.1). The pH of blood stored in CPD falls less than in ACD, thus 2,3-DPG is better maintained (falling to 25-35% of the original level after 3 weeks storage). Post transfusion survival of red cells stored in CPD solution is slightly better than that of ACD stored cells, and the shelf life can be extended to 28 days (Mollison et al., 1987).

(D) Citrate Phosphate Dextrose Adenine (CPD-A) Solution

The addition of rejuvenating agents or purine nucleosides (adenosine, inosine) to