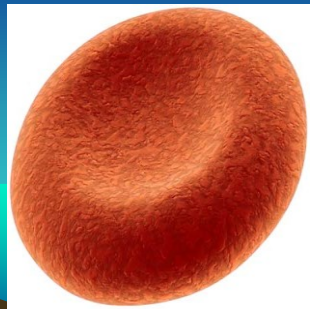
welcome

بسم الله الرحمن الرحيم

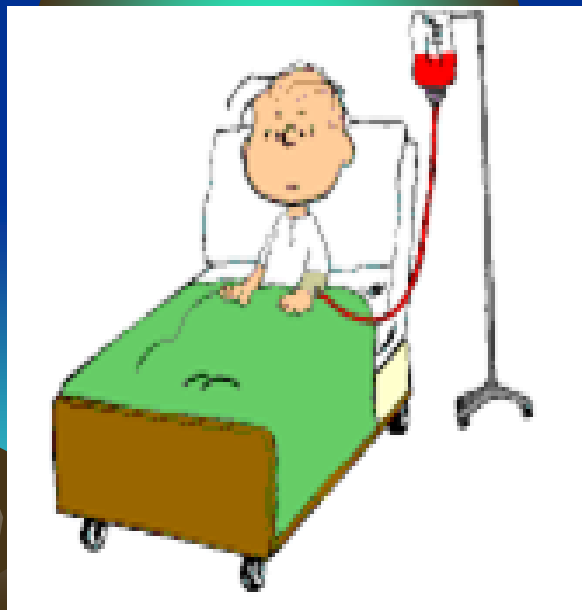


Hazards of transfusion

By Fatin Al – Sayes MD, Msc, FRCpath

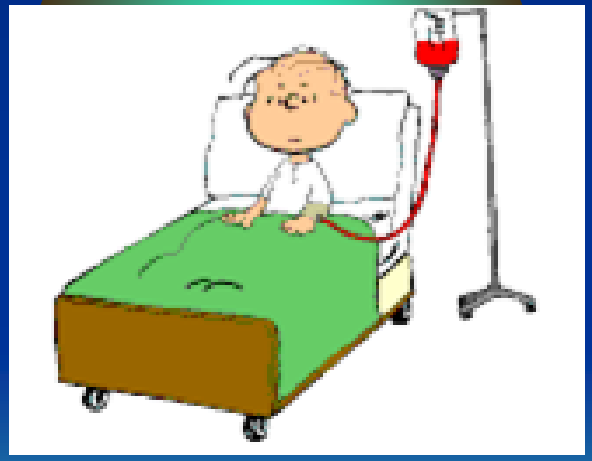
Associate Professor , Consultant Hematologist

KAUH , Jeddah



Transfusion A Risk Factor ?

Donating blood saves lives



THIS DRUG
SHOULD BE A MIRACLE...!

Today's agenda

Immunological Complications

- Acute
- Delayed

Non – immunological complications

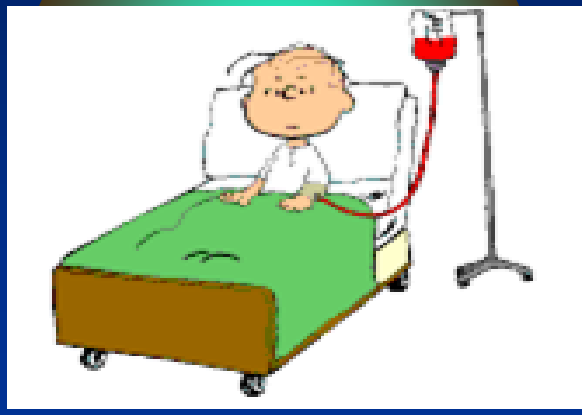
- Acute
- Delayed

Shot

Hazards of Blood Transfusion Versus Hazards of Everyday Life

Issues In Neonate

Conclusions



Complications:

Immunological

Non - immunological

Table-1

Immune – Mediated Transfusion Reactions

Acute	Delayed
Hemolytic Alloimmune	
Febrile-Non hemolytic	Hemolytic
Transfusion-related	GVHD
Acute lung injury (TRALI)	Purpura
Urticarial	
Anaphylactic	

Table -2

Non-Immune Mediated Transfusion Reaction

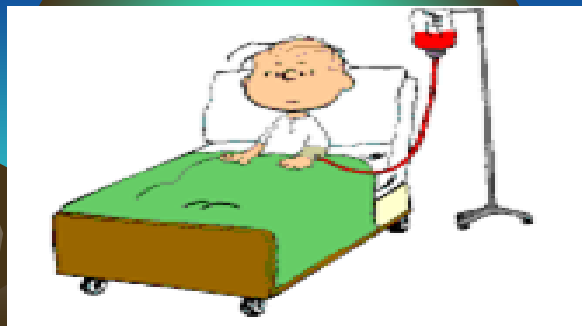
Acute	Delayed
Hemolytic	Metabolic
Embolic	iron over load
Metabolic	infection
(.) Citrate toxicity	* Bacterial
(.) Coagulopathy	* Viral
(.) Hypothermia	
(.) Hyperkalemia	
(.) Hypocalcaemia	
Circulatory overload	

Acute Hemolytic Transfusion Reaction

Destruction of transfused blood cells by the recipient's antibodies.

Most of these cases result from transfusion of ABO – incompatible red cells

Brecher ME et. al., Technical Manual, 14th Ed., AABB Press, 2002



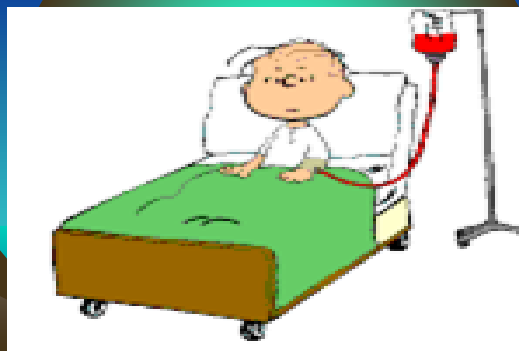
Acute Hemolytic Transfusion Reaction:cont

Has been reported to occur approx 1:25,000 transfusion

Account for over 50% of reported deaths related to transfusion.

Human error plays a large part in these reaction.

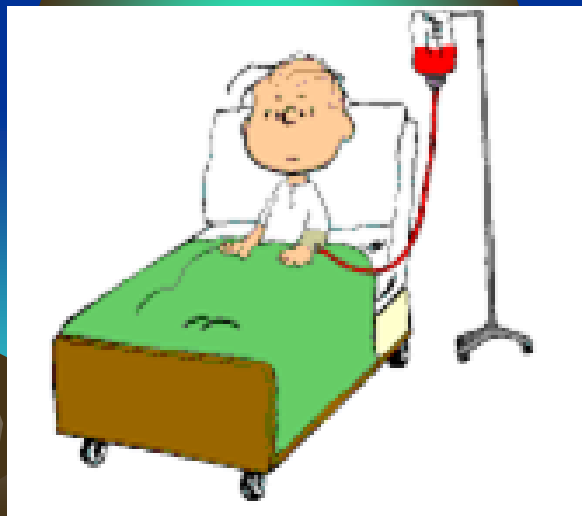
Physician error approx 20% of the time

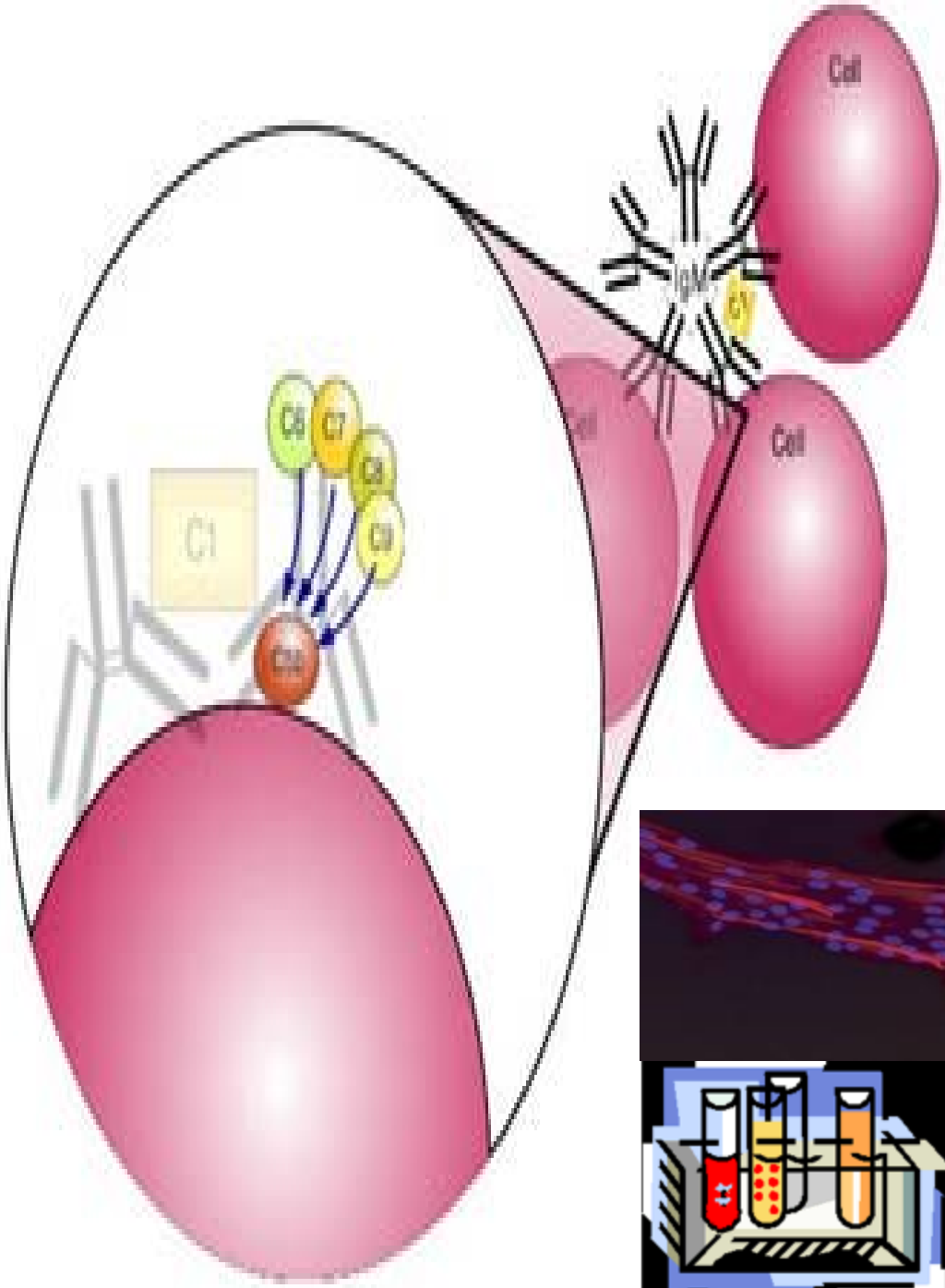


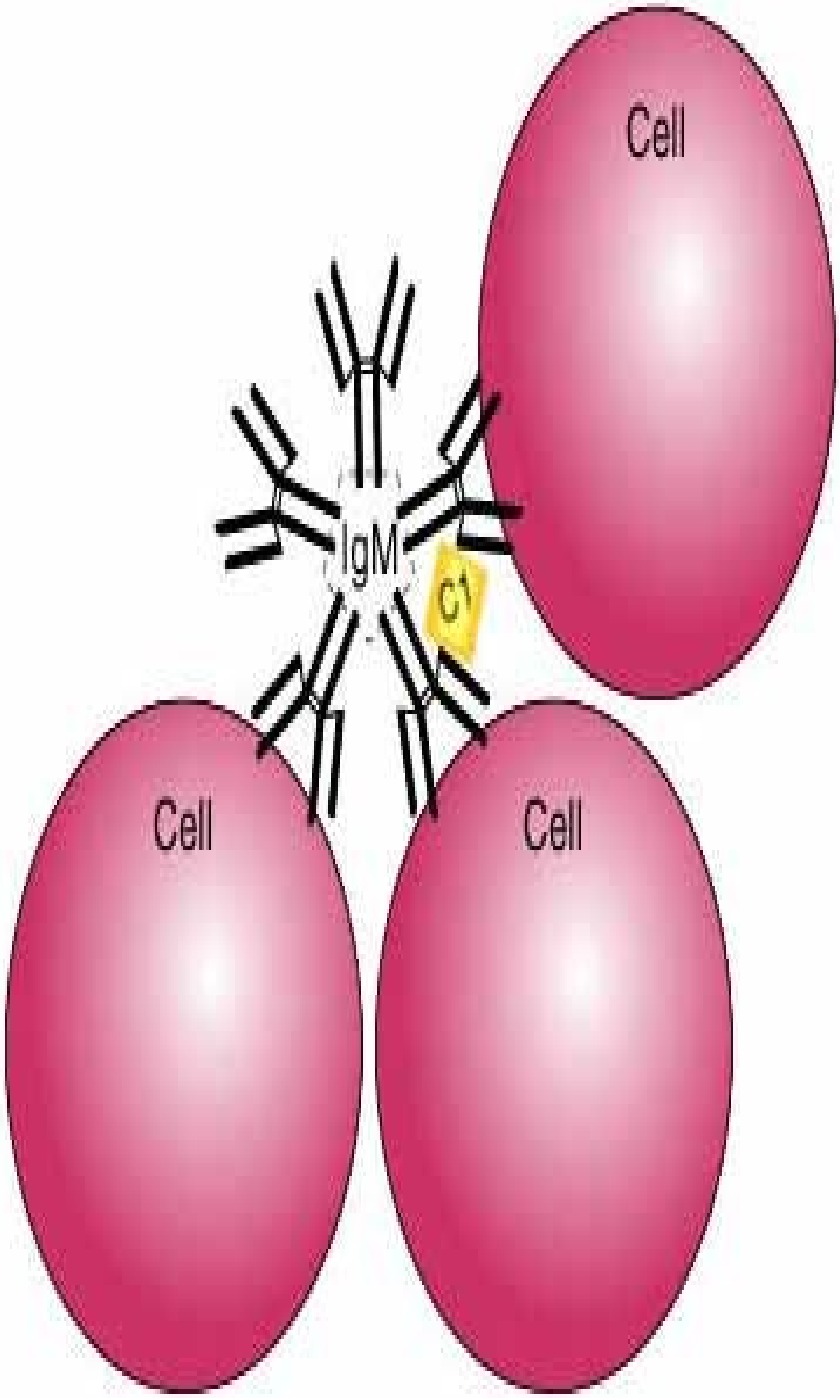
Acute Hemolytic Transfusion Reaction:cont

Operating room is the most common site of this error

Anesthesiologist is the commonly implicated physician




Cell
IgM
C1
C6
C7
C8
C9
Cell
Cell


Cell
IgM
C1
Cell
Cell

Symptoms of AHTR

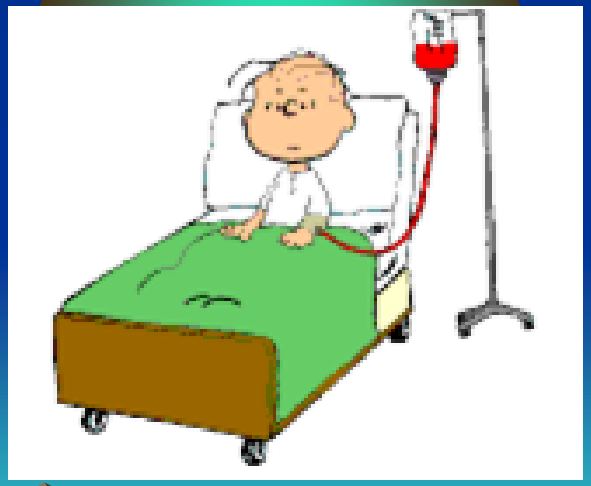
Chills

Fever

Nausea

Chest pain

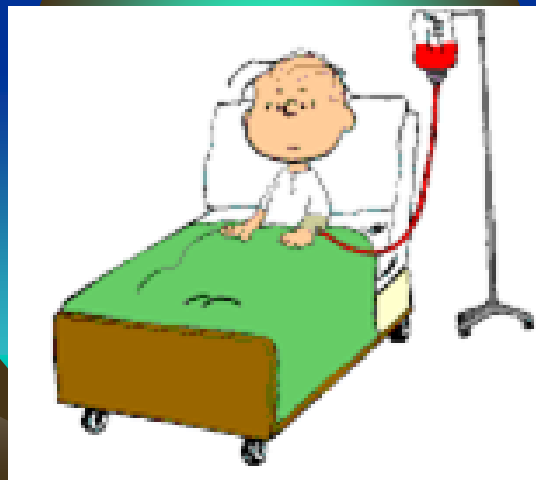
Flank pain



Symptoms of AHTR

Anesthetized patients

- Rise in temperature
- Unexplained tachycardia , hypotension
- Hemoglobinurea
- oozing in the surgical field
- DIC, shock, renal shutdown



Management

Stop the transfusion

Hydration

Treat patient symptomatically

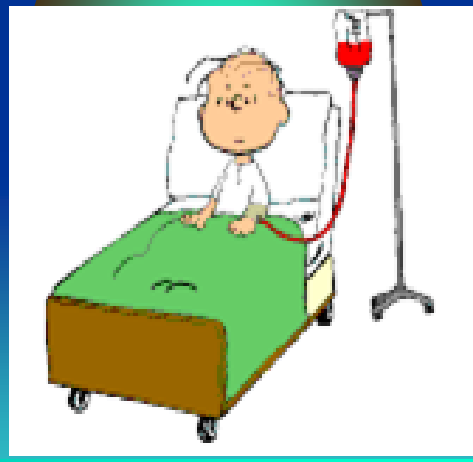
Send blood bag and tubing to culture

Repeat grouping and compatibility

testing , DAT

CBC, PBS

Coagulation profile and urine test



Febrile Non – Hemolytic Transfusion Reaction (FNHTR)

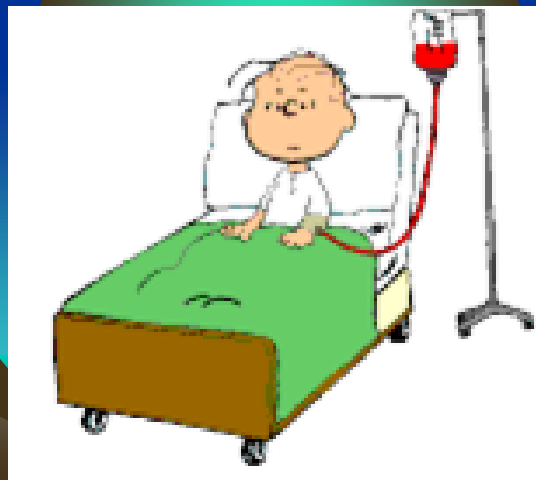
Occur in 1% of transfusion

1ºC increase in temp or shivering towards the end of transfusion or up to 2 h post transfusion.

Other causes of fever are eliminated

Multi transfused or previously pregnant patients

Secondary to antileukocyte antibodies present in the recipient's plasma directed against antigens present on WBCs



Febrile Non – Hemolytic Transfusion Reaction : Cont

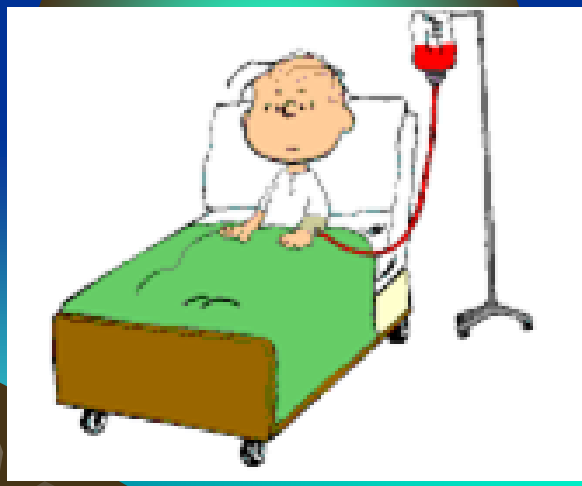
Some reactions are thought to be due to the infusion of cytokines produced by leukocytes during component storage

No available pre or post transfusion tests

Slow down transfusion rate

Antipyretics

Seminars in Hematology 2005; 42: 165-168



Febrile Non – Hemolytic Transfusion Reaction (cont)

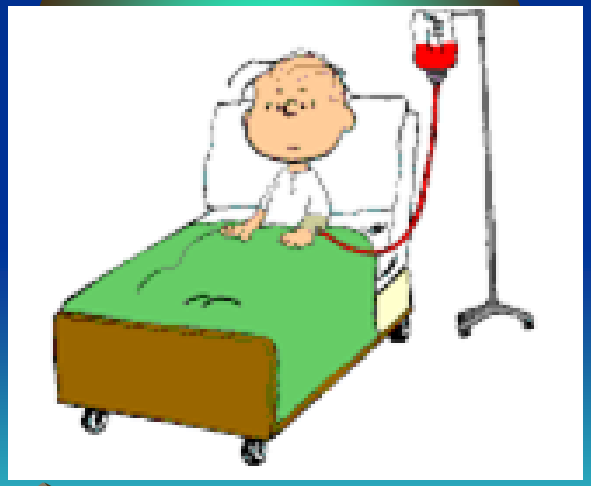
Prevention

leukodepleted blood and platelet

prestorage leukocyte reduction

Washed RBC's

Deglycerolized RBC's



Transfusion – Related Acute lung Injury (TRALI)

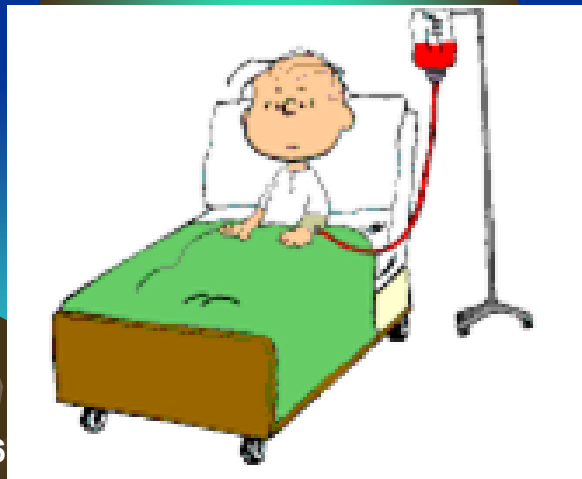
Incidence : 1: 10,000

FFP, large volume , rapid Tx

Occur usually within 6 hours of transfusion

Severity is proportional to the volume transfused

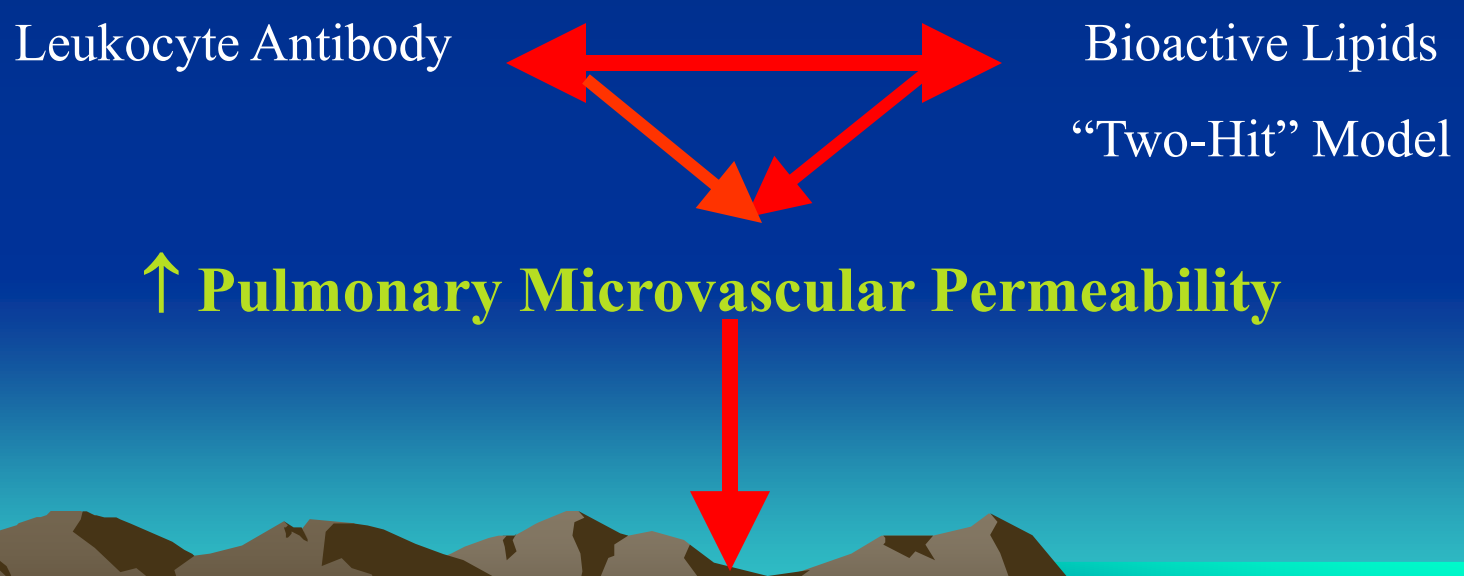
Associated with the presence of granulocyte antibodies in the donor plasma or recipient

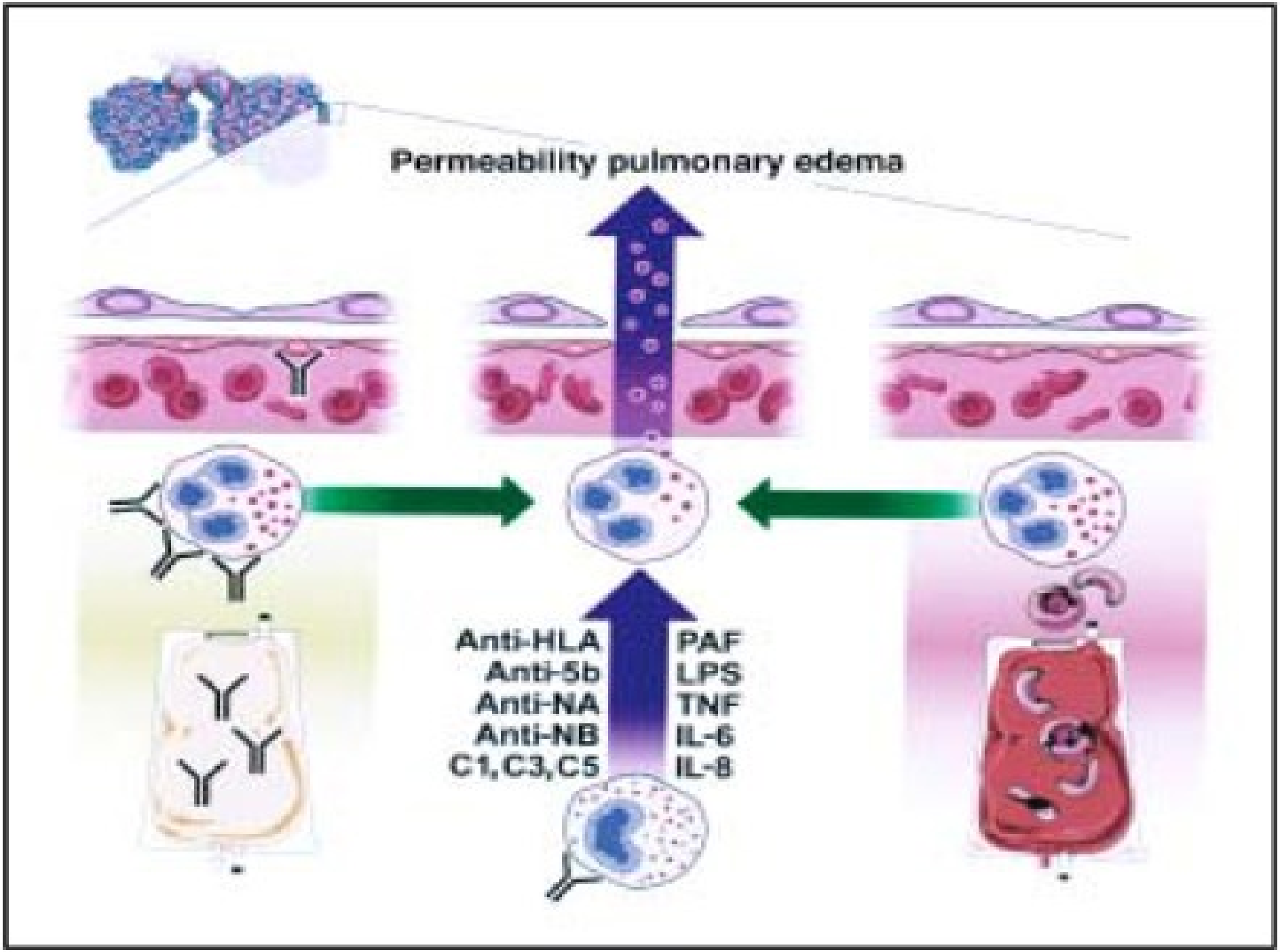


plasma and plasma fractions", Best Practice and Research Clinical Haematology 2006

TRALI

- Pathogenesis
  - Two current working model hypothesis
  - Both models are directed against increase in pulmonary microvascular permeability




Permeability pulmonary edema
Anti-HLA
Anti-5b
Anti-NA
Anti-NB
C1,C3,C5
PAF
LPS
TNF
IL-6
IL-8

Transfusion – Related Acute lung Injury (TRALI) : cont

Acute respiratory Difficulties

Chest x – ray looks like ARDS in the absence of cardiac involvement

GIFT (PNL – Antileukocyte Ab)

Prevention : un – transfused male donor , plasma pheresis donors

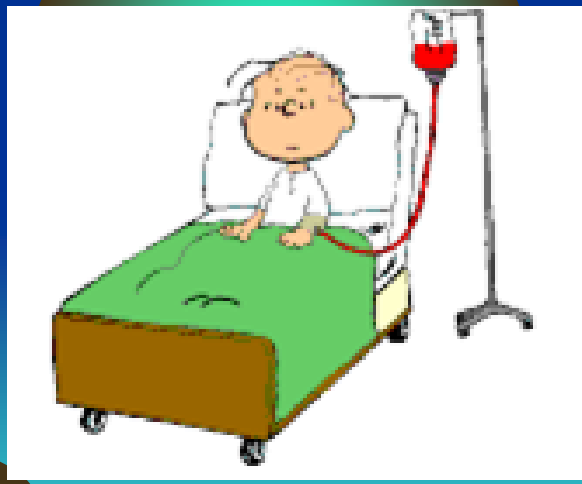
Treatment

(1) stop Tx (2) ICU

(3) IVF (4) O2

(5) Exclude donor

Recovery is usually quick



Shander A, Popovsky MA, "Understanding the Consequences of Transfusion-Related Acute Lung Injury", Chest 2005; 128: 598-604.

Allergic (Urticarial) Transfusion Reaction

Recipient has antibodies to the donor's plasmas

Complicate about 1 % of transfusion

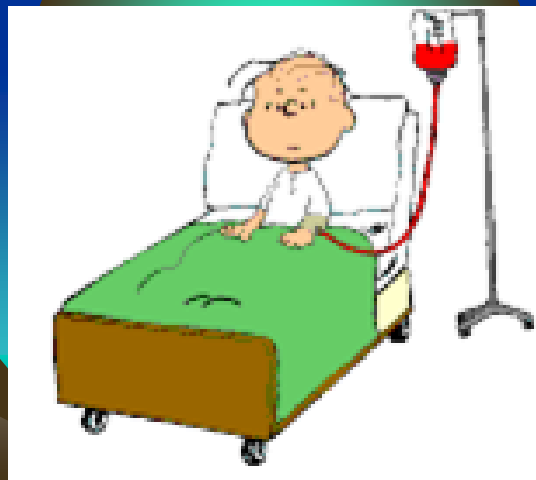
Offending protein is not identified

Local redness, itching ,hives ,and wheezing

Interrupt the transfusion

Treat with antihistamines

Resume the transfusion when the symptoms have subsided



Anaphylactic – Transfusion Reaction

Blood component that contain large volumes of plasma

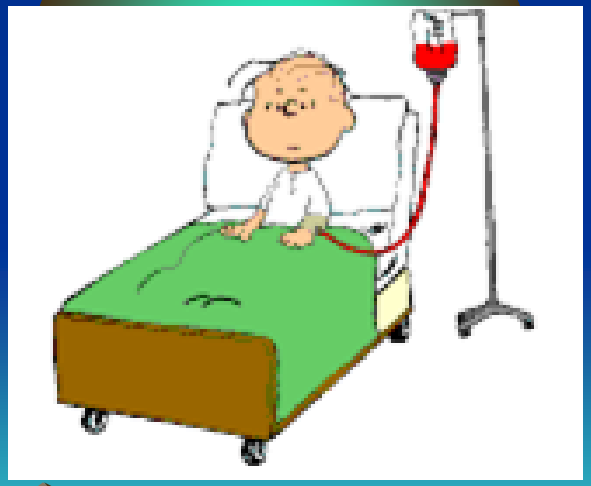
Occur in 1 : 150,000

1: 700 – 900 people never made IgA

Occurs when exposed to normal blood products which contain IgA

Symptoms occur after infusion of only few milliliters of blood

Immediate hypersensitivity type of immune response



Anaphylactic – Transfusion Reaction: cont

Bronchospasm , vomiting , diarrhea and vascular collapse

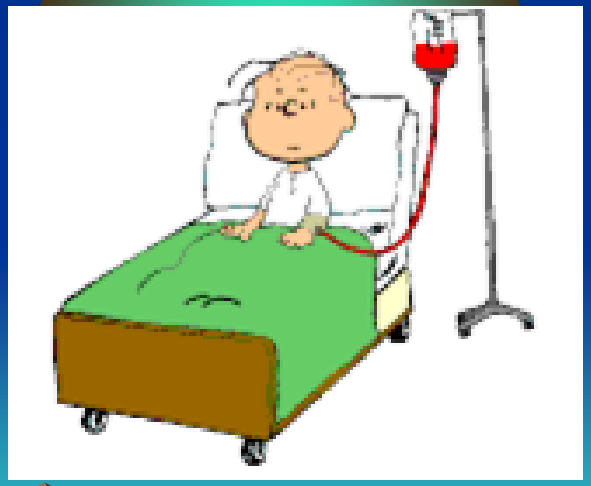
Treat with epinephrine , hydrocortisone

Should receive blood and blood product

from donors who are also IgA deficient

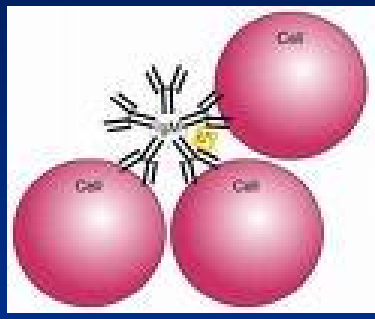
Autologus donation

Washed cells



Gilstad CW, "Anaphylactic transfusion reactions", Current Opinion in Hematology 2003; 10: 419-423.

Delayed Hemolytic Transfusion Reaction



Unexplained fall in Hb 3 – 7 days post transfusion

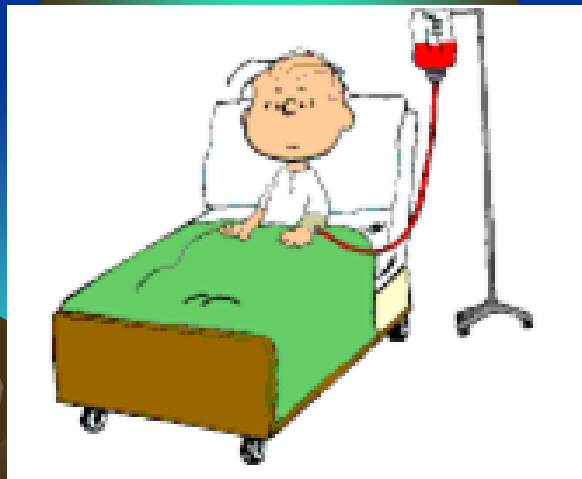
Mild fever , chills , dark urine and jaundice

Recipients may be sensitized by previous transfusion or during pregnancy

The corresponding Ab's may be undetectable in pre - transfusion testing

Anamnestic response leads to Ab production

Positive DAT



Graft- Versus- host Reaction (GVHD)

Rare , 75 – 90 % mortality rate

Concern of particular population

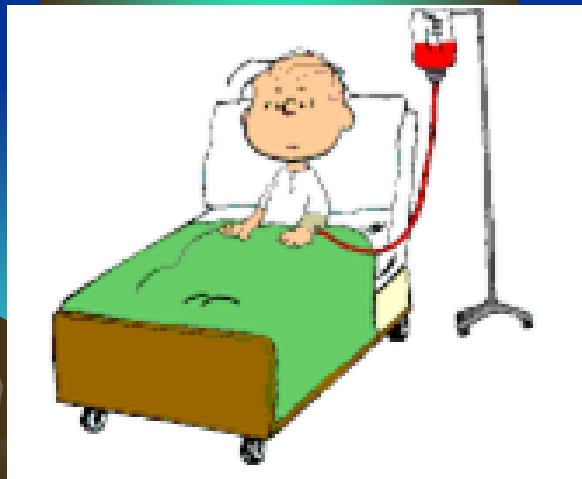
T – lymphocyte from the donor proliferate in response to histocompatibility antigens in the recipient

Fever , rash , diarrhea

Pancytopenia and elevated liver enzymes

1 – 6 weeks post Tx

Blood from parents or close relatives



Graft- Versus- host Reaction (GVHD) cont

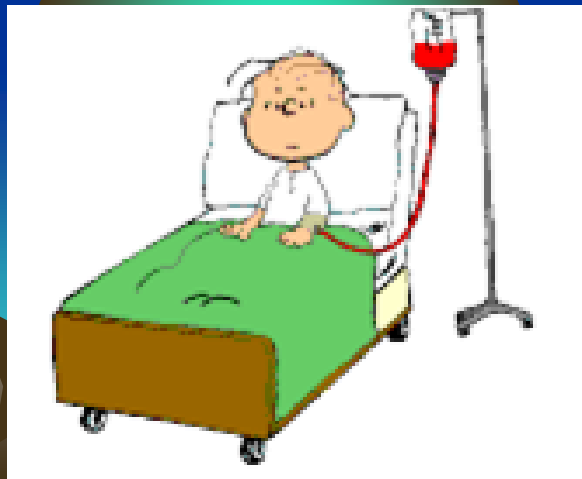
Diagnosis

Skin biopsy

Peripheral blood cytogenetics or HLA

Prevention and Treatment

Irradiation 25 GY



Post – Transfusion Purpura

Rare

Potentially lethal complication

Immune mediated thrombocytopenia

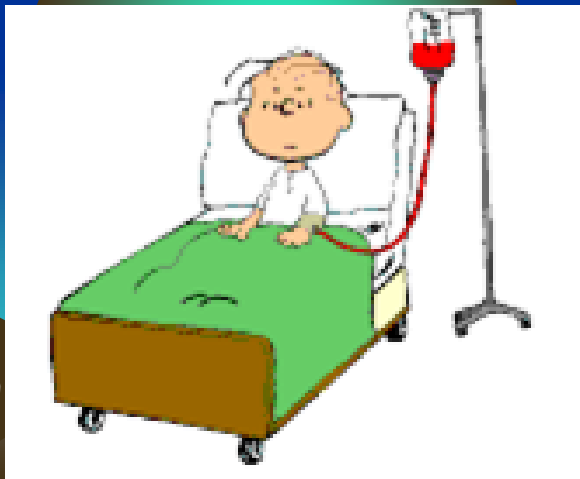
Female patient

5 – 12 days post Tx

HPA1a negative patient with anti – HPA1a

IVIG

Platelets transfusion to cover acute bleeding



Sepsis from Bacterial contamination

Platelets

Skin contaminants most common cause

Pooled platelets 1 : 1000

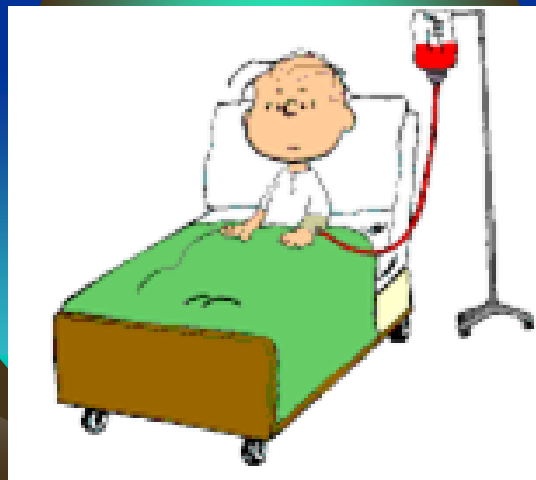
Plateletpheresis 1 : 5000

RBC

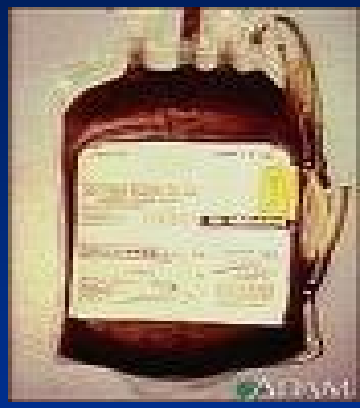
Yersinia

Gram negative organisms capable of growing at cold temp.

Gram positive are more likely to be found in products stored at room temp .



Sepsis from Bacterial contamination : cont

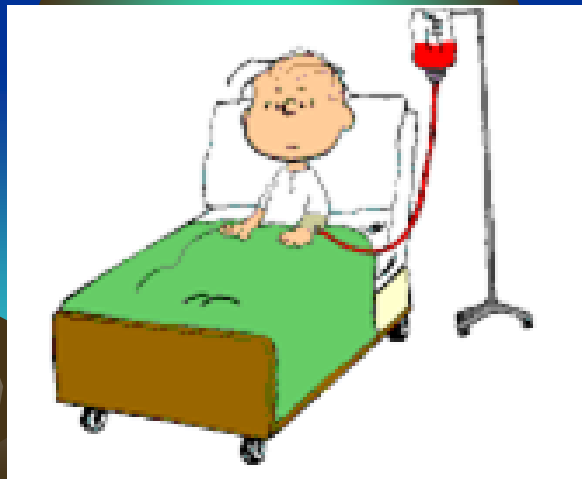


Symptoms of non – circulatory collapse and fever

Prompt recognition of a possible reaction is essential

Aggressive broad – spectrum antibiotics

Report urgently to blood bank

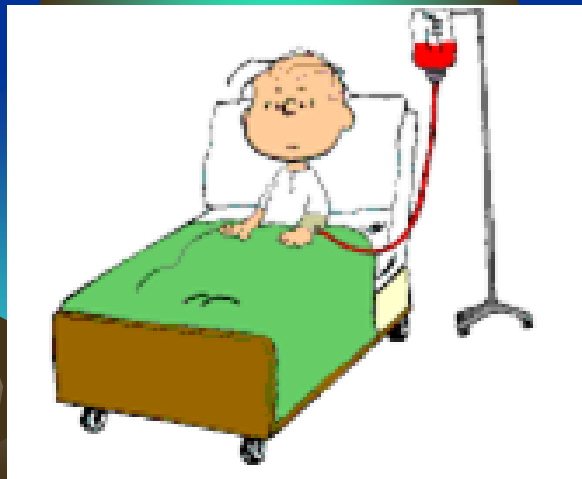


Fluid overload

Too much fluid infused , or too rapid infusion

Pregnant ladies , old age , chronic anemia , cardiac function compromise

Acute LVF



Non-immunological complications

Vasoactive substances

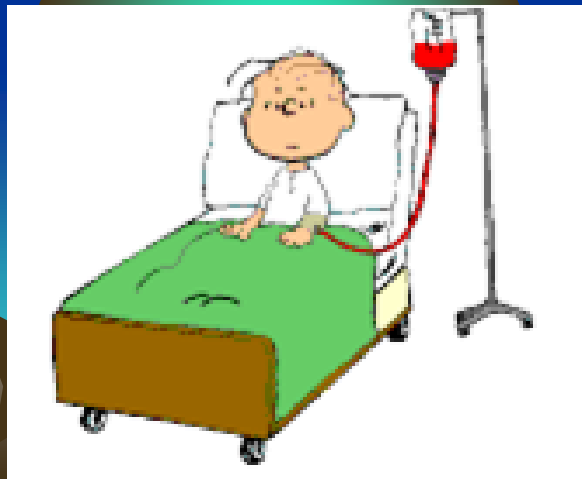
Prekallicrein substances

Hypotension, vasodilatation, nausea

Cardiac arrest due to cold blood

Citrate toxicity

- Muscle tremor
- Cardiac output decrease
- Hypotension



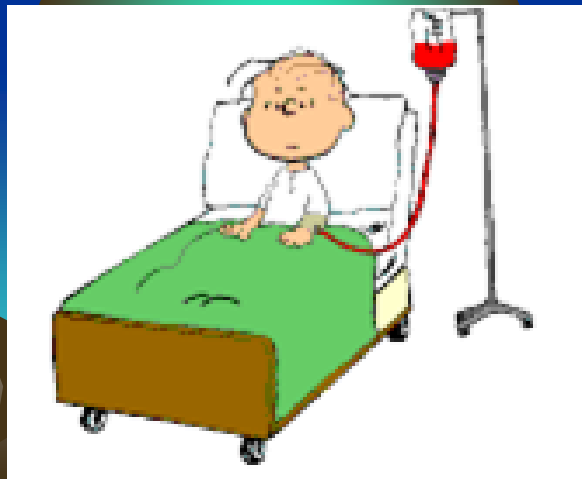
Non-Immunological complications

Potassium toxicity

Air embolism

Micro embolism

Septic thrombophlebitis

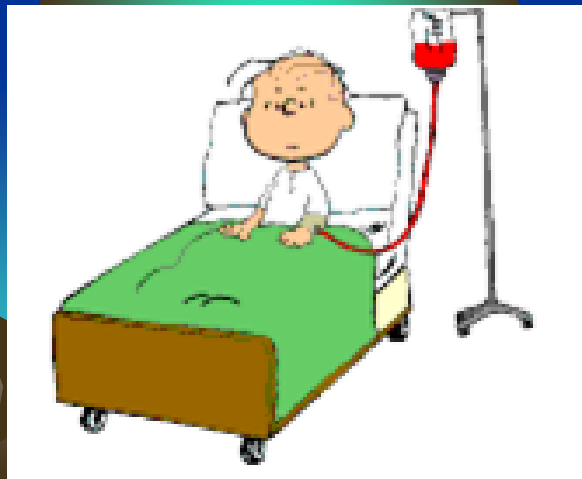


Other interaction

Change of the immune response

Postoperative infections ?

Cancer recurrence ?



Infectious complications

Bacteria

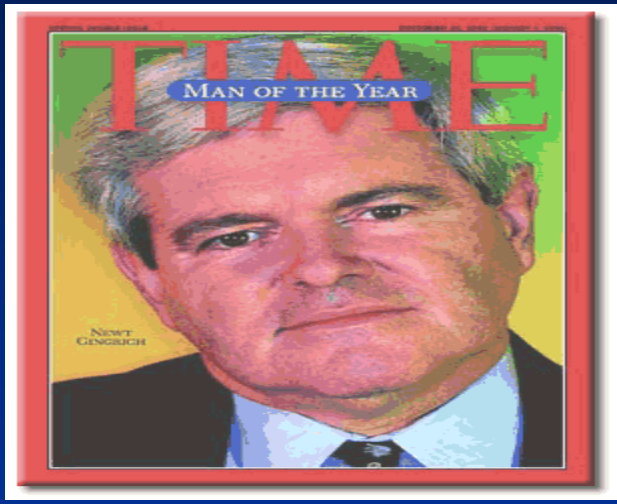
Virus

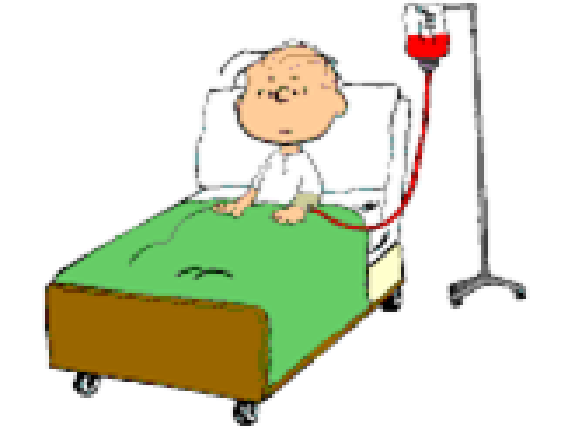
Protozoes

Parasites

Prions:

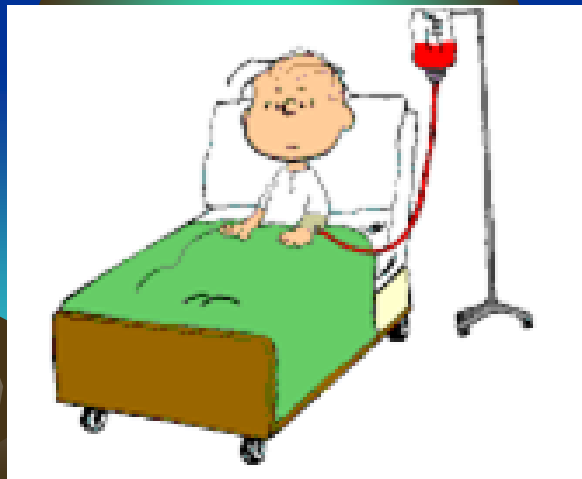
CJD , nvCJD ?



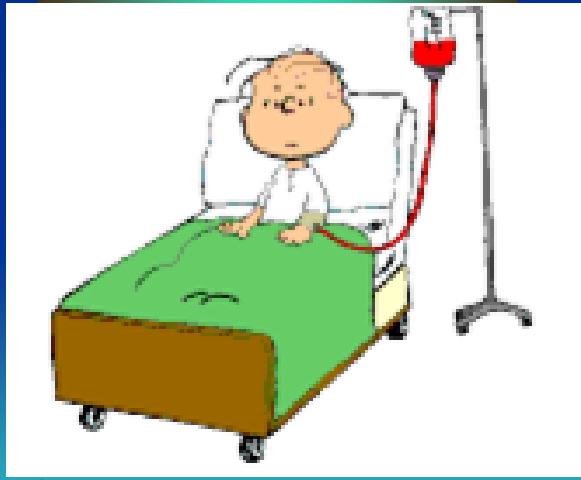


Transfusion Transmitted Disease

HBV	1;200,000
HCV	1:2000,000
HIV	1:2000,000
HTLV – 1	1:3000,000



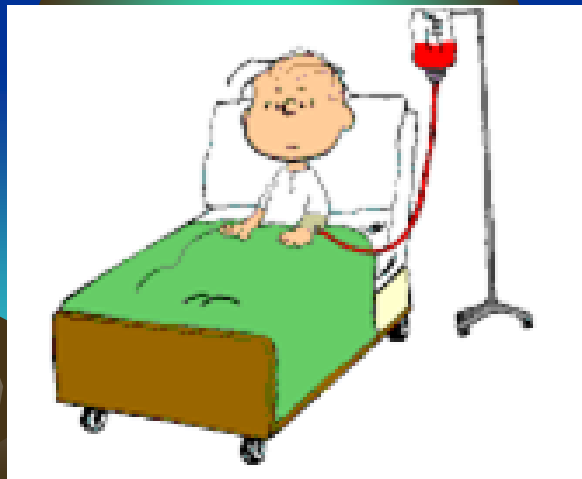
...WONDER HOW OFTEN THESE SIDE EFFECTS OCCUR...?



SHOT: “Severe Hazards of Transfusion

Voluntary and confidential collecting of data about transfusion risks, using report forms.

The aim is to improve transfusion safety

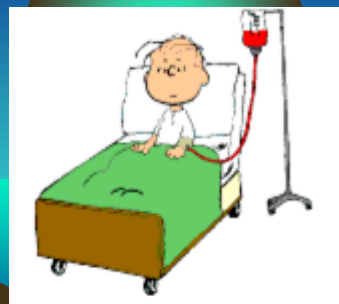


SHOT: "Severe Hazards of Transfusion

Severe Clinical Outcome (SHOT)

Death: Attributed to transfusion
Not due to underlying condition

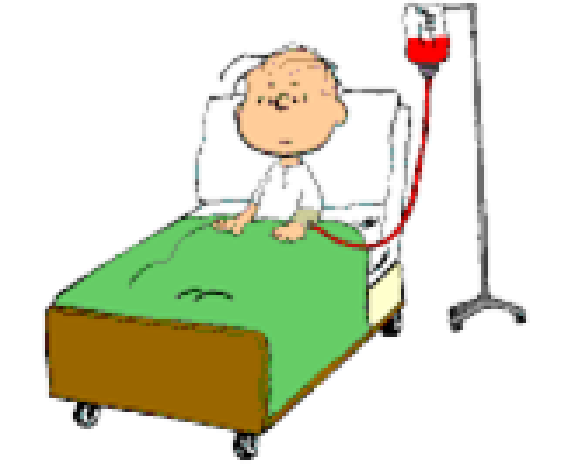
Major Morbidity: Intensive care admission and/or ventilation
Dialysis and/or renal dysfunction
Major haemorrhage from transfusion-induced coagulapathy
Intravascular haemolysis
Potential RhD sensitiation in a female of child-bearing potential
Persistent viral infection
Acute symptomatic confirmed infection
(viral, bacterial or protozoal)



Hazards of Blood Transfusion Versus Hazards of Everyday Life

1 per 20,000	Sever hazard of transfusion
1per 40,000	Incorrect blood component transfused
1 per 300,000	Death attributed to transfusion
1 per 1 – 2 m	Transfusion transmitted HIV (calculated)
1 per 10,000	Death due to sever accidents at home
1 per 50,000	Death due to general anaesthesia
1 per 1 – 2 m	Being killed by lightening

MAYBE IT'S NOT SO DANGEROUS AFTER ALL.....

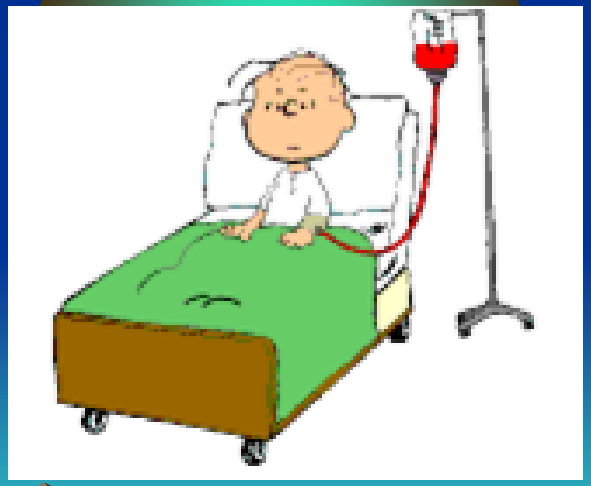


Who is Responsible for the Transfusion Hazards

National Transfusion Service

Hospital blood bank

Phlebotomy and Nurses



Reduction of Risks

Good manufacturer practice

Document and guidelines

Donor selection

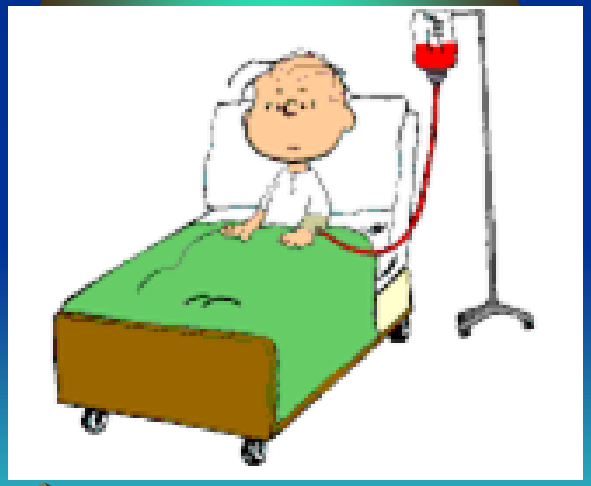
Testing of units

Viral inactivation

Education

Auditing

Avoiding unnecessary use of blood and blood components



Transfusion Issues in Neonates

Neonate do not produce red blood cells antibodies.

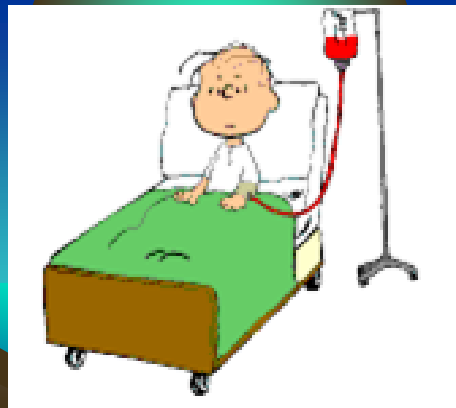
FNHTR is rear in neonates

Allergic reactions are rare

TRALI is very rare ,one report associated with a maternal-infant transfusion

Hemolysis related to T-antigen activation is a rare complication of sepsis and necrotizing enterocolitis in infant.

T-GVHD, typically occurs in severely immunocompromised patients, low birth, weight and intrauterine or exchange transfusion

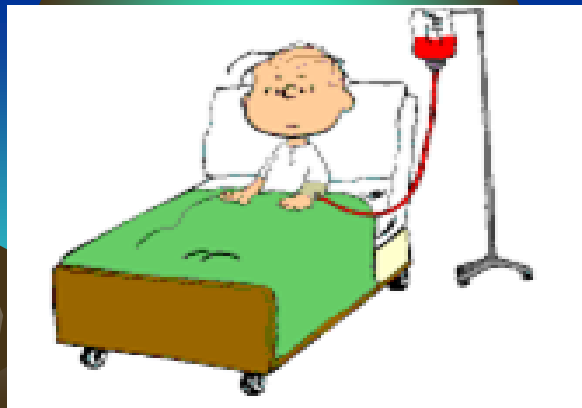


Transfusion Issues in Neonates :cont

Volume over load is a common problem in neonatal period.

Metabolic complication may be encountered in neonates more than adult.

CMV virus transmission through blood was documented by Yeager et al in 1981 , leucoreduction reduced the risk



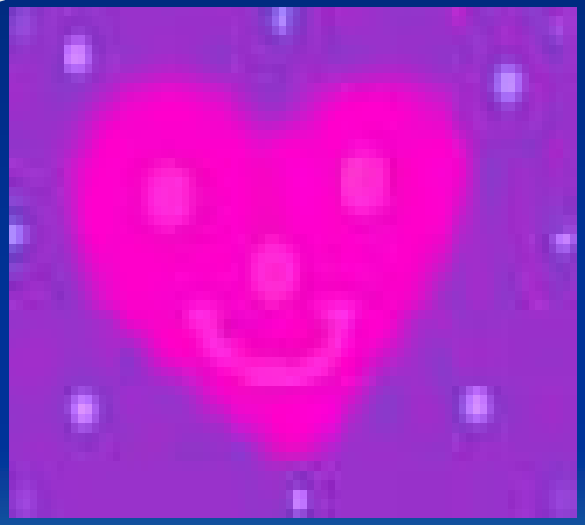
Conclusions

Blood is a biological substance and may never be entirely risk – free, however the risk is low compared to other kind of risks

Some are relatively common and should never occur (IBCT) the rate can be reduced in a simple way and at low cost

Others are very seldom, but create a lot of fear (HIV)
They can be avoided only in a complicated expensive way

THANK YOU



Blood donors do it with love