Understanding myelodysplasia and Introduction to Blood Transfusion

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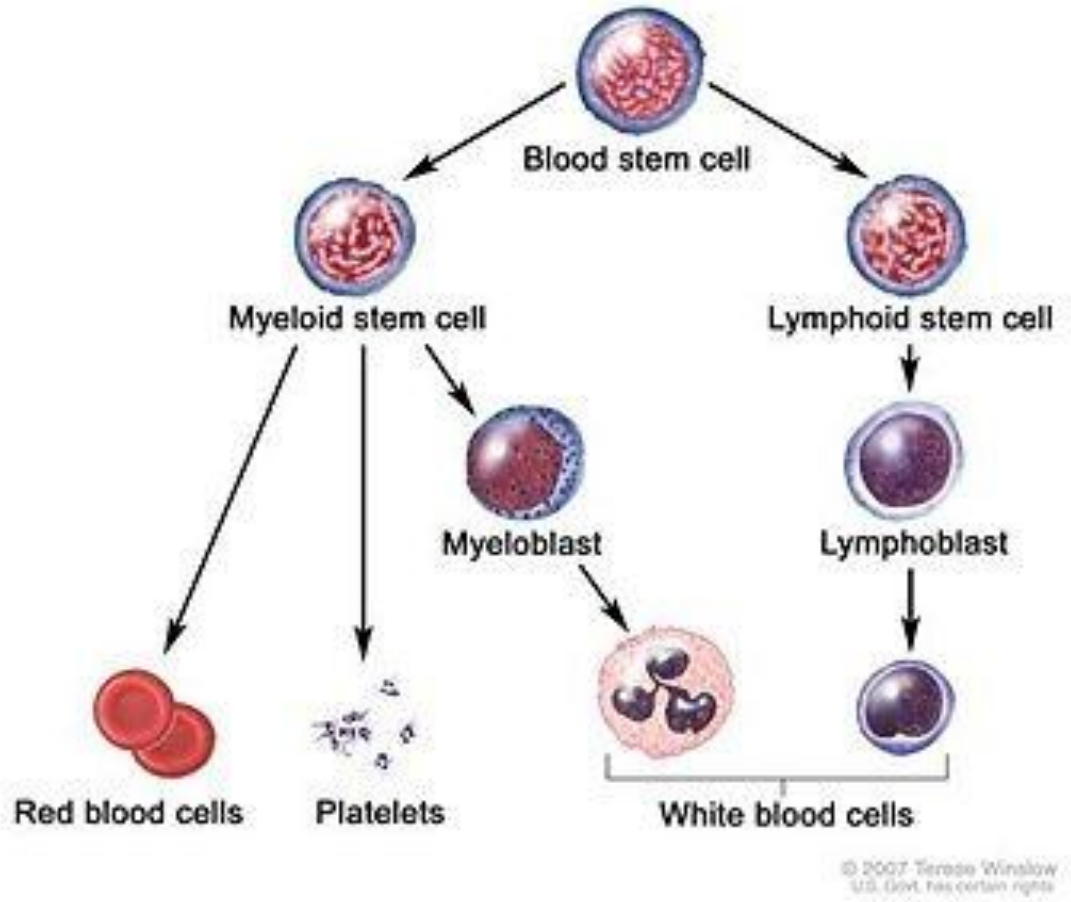

Blood stem cell
Myeloid stem cell
Lymphoid stem cell
Myeloblast
Lymphoblast
Red blood cells
Platelets
White blood cells

Classification of MDS

- Refractory anaemia.
- Refractory anaemia with ringed sideroblasts.
- Refractory anaemia with excess blasts.
- Refractory anaemia with excess blasts in transformation.
- Refractory cytopenia with multilineage dysplasia.
- Myelodysplastic syndrome associated with an isolated del(5q) chromosome abnormality.
- Unclassifiable myelodysplastic syndrome.
- Chronic Myelomonocytic leakaemia

MDS: Risk factors

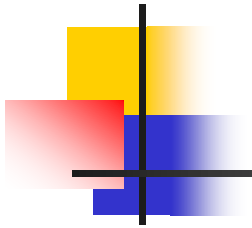
- Being male or white.
- Being older than 60 years.
- Past treatment with chemotherapy or radiation therapy
- Being exposed to certain chemicals, including tobacco smoke,
- pesticides, and solvents such as benzene
- Being exposed to heavy metals, such as mercury or lead.

MDS: symptoms

- Shortness of breath.
- Weakness or feeling tired.
- Having skin that is paler than usual.
- Easy bruising or bleeding.
- Petechiae (flat, pinpoint spots under the skin caused by bleeding).
- Fever or frequent infections.

MDS: what determins prognossis

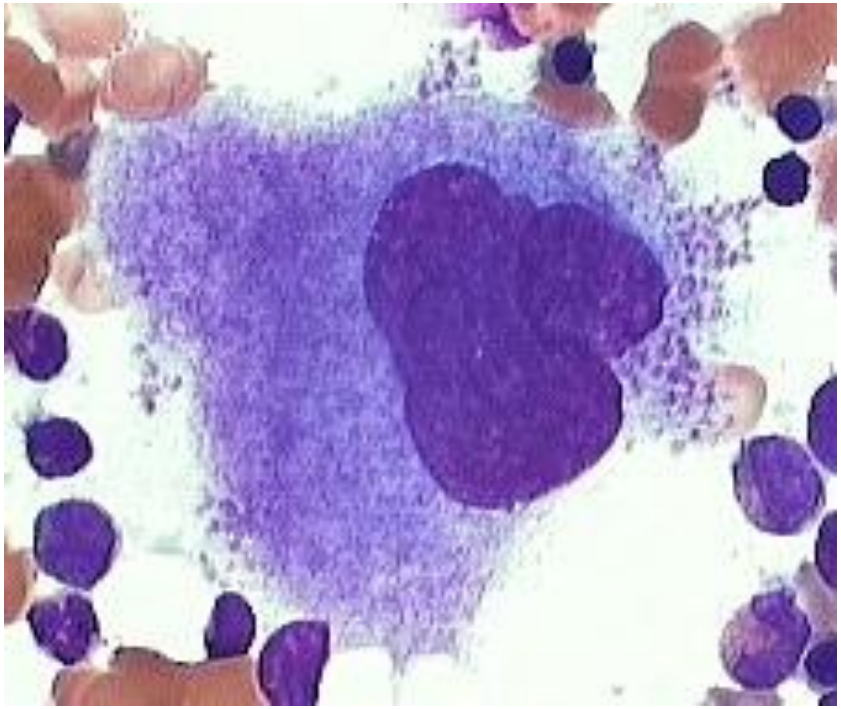
- The number of blast cells in the bone marrow.
- Whether one or more types of blood cells are affected.
- Certain changes in the chromosomes.
- Whether the myelodysplastic syndrome occurred after chemotherapy or radiation therapy for another disease.
- Whether the myelodysplastic syndrome has progressed
- after being treated.
- The age and general health of the patient.

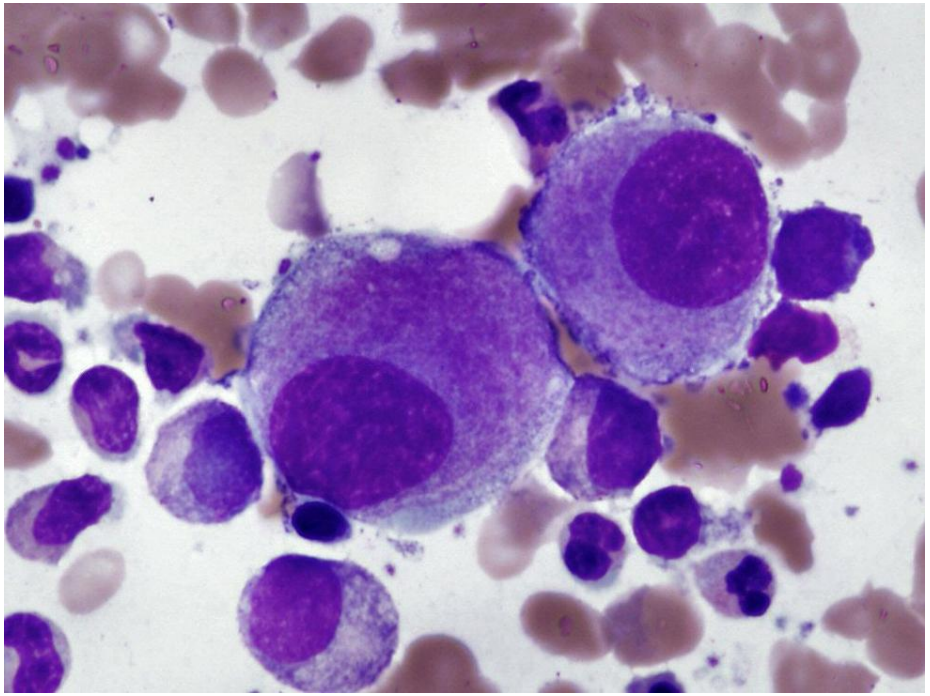


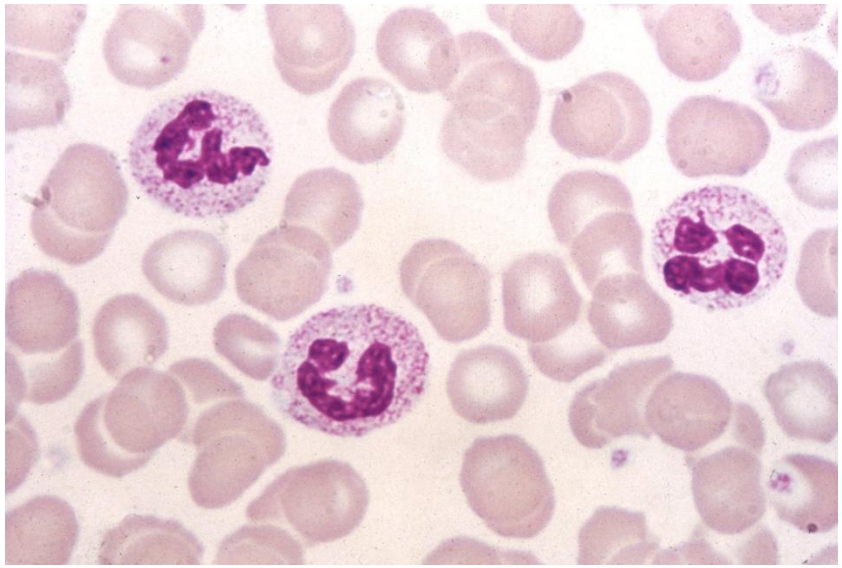
Low risk	
INT-1	0.5-1.0
INT-2	1.5-2.0
High risk	>2.5

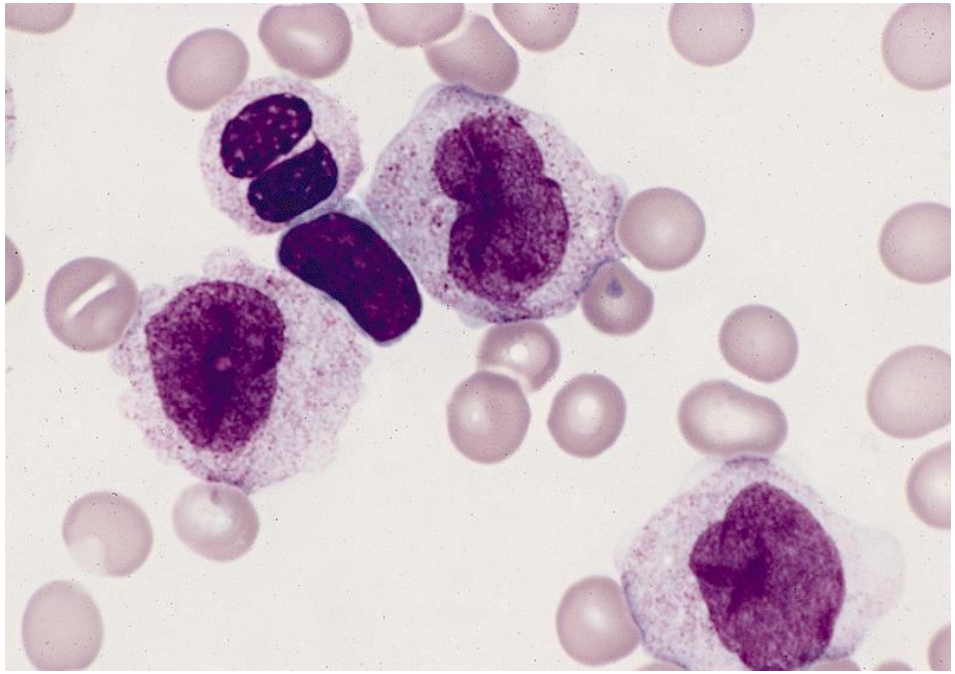
MDS: Diagnosis

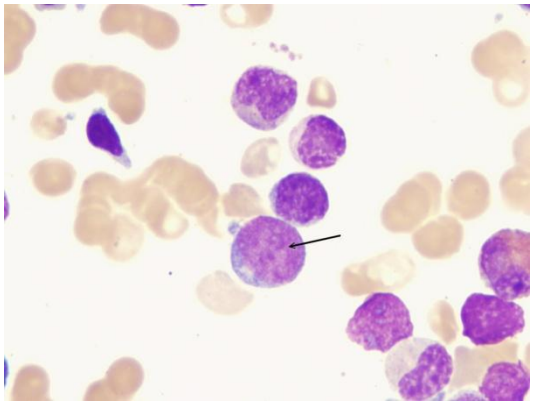
- Full blood count
- Blood film
- Bone marrow examination
- Cytogenetics
  - Additional blood tests for biochemistry, immunological investigations, clotting etc

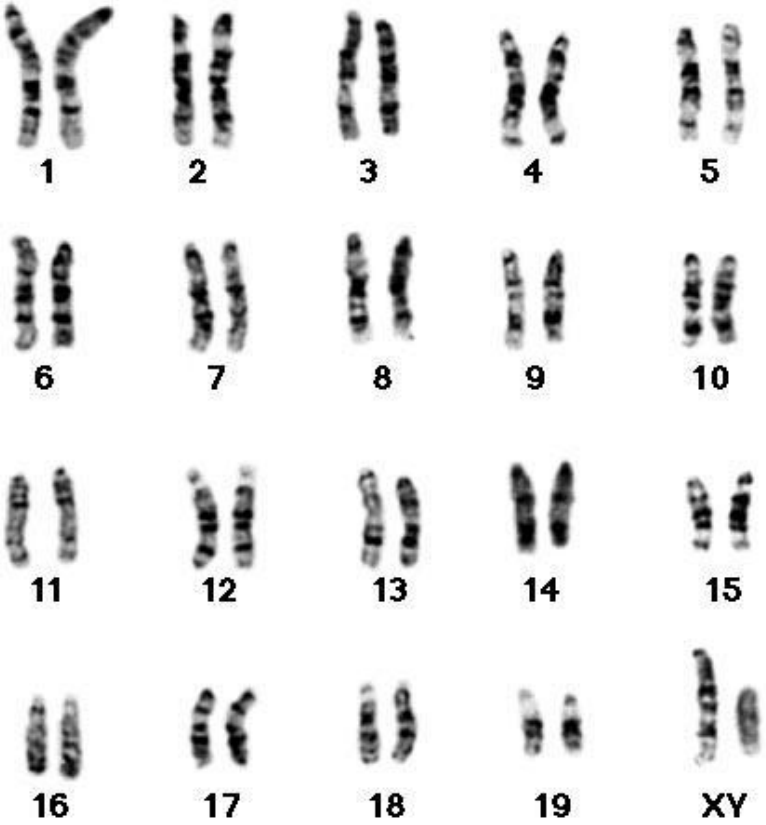








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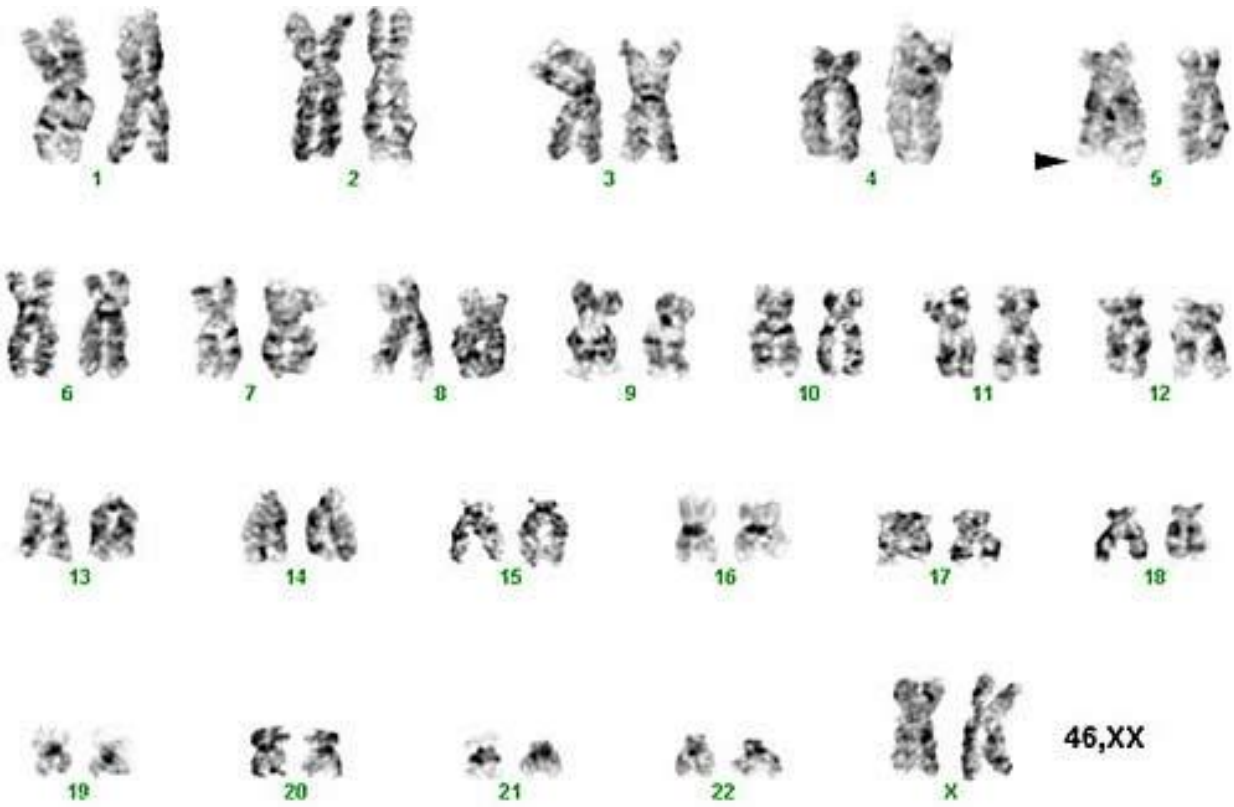
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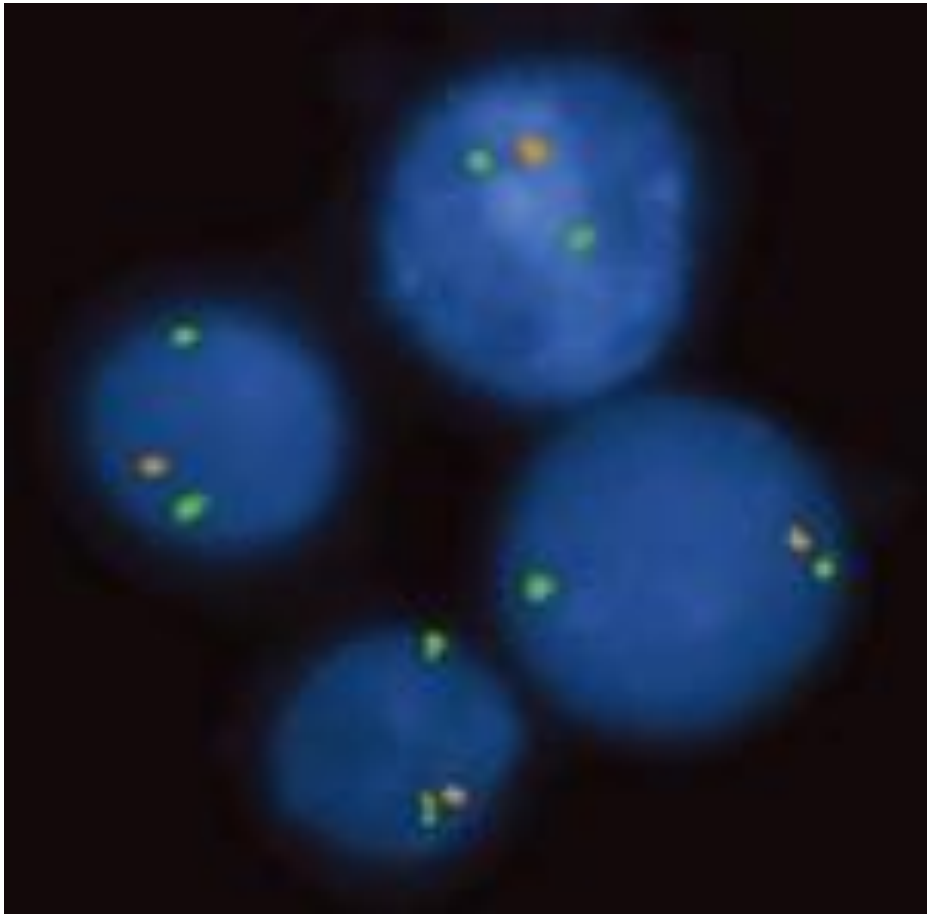


MDS: treatment options

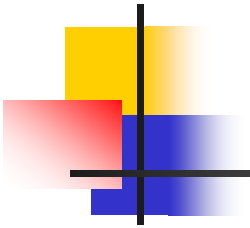
- For young and healthy MDS patients, especially those with aggressive forms of the disease, chemotherapy may be used.
- For some patients, very high doses of chemotherapy and radiation designed to destroy bone marrow cells followed by an infusion of blood or marrow stem cells from a matched family member or unrelated donor can sometimes cure the disease.

MDS: treatment options

- Some patients with milder forms of MDS may survive for many years with this type of "supportive care," using growth factors, transfusions and antibiotics as needed.

MDS:TREATMENT

- No known drugs cure myelodysplastic syndromes (MDS), and age or serious medical conditions may keep many MDS patients from receiving aggressive chemotherapy treatments



- Azacitidine is an injectable drug which may improve quality of life and help delay progression to acute myeloid leukaemia.
- Azacitidine has been shown to improve survival in patients with higher-risk myelodysplastic syndromes.
- Lenalidomide (Revlimid), which is taken in pill form, is sometimes called immune modulating therapy. It has been most helpful to those who have acquired abnormalities of chromosome 5.

Blood - Where From?

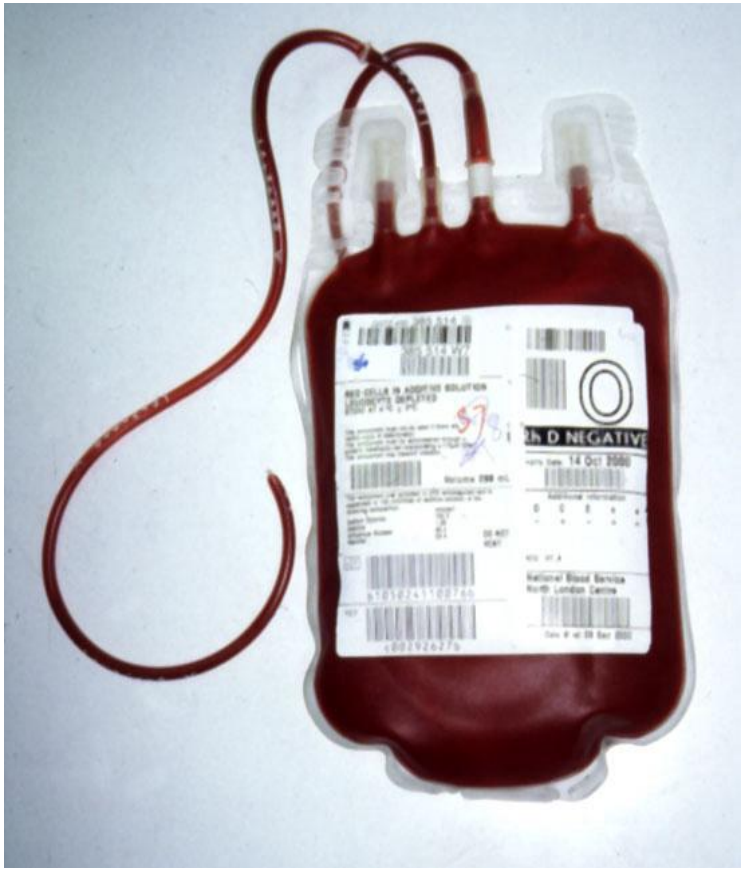
- Human source - no synthetics yet
  - not risk free
- Scarce resource
  - Need 10,000 units of blood/day in U.K.
  - <5% population are regular donors

Use carefully!

Blood components

- Unpaid, volunteer donors
  - Whole blood - every 3-4 months
  - Platelets by apheresis-

every 4 weeks



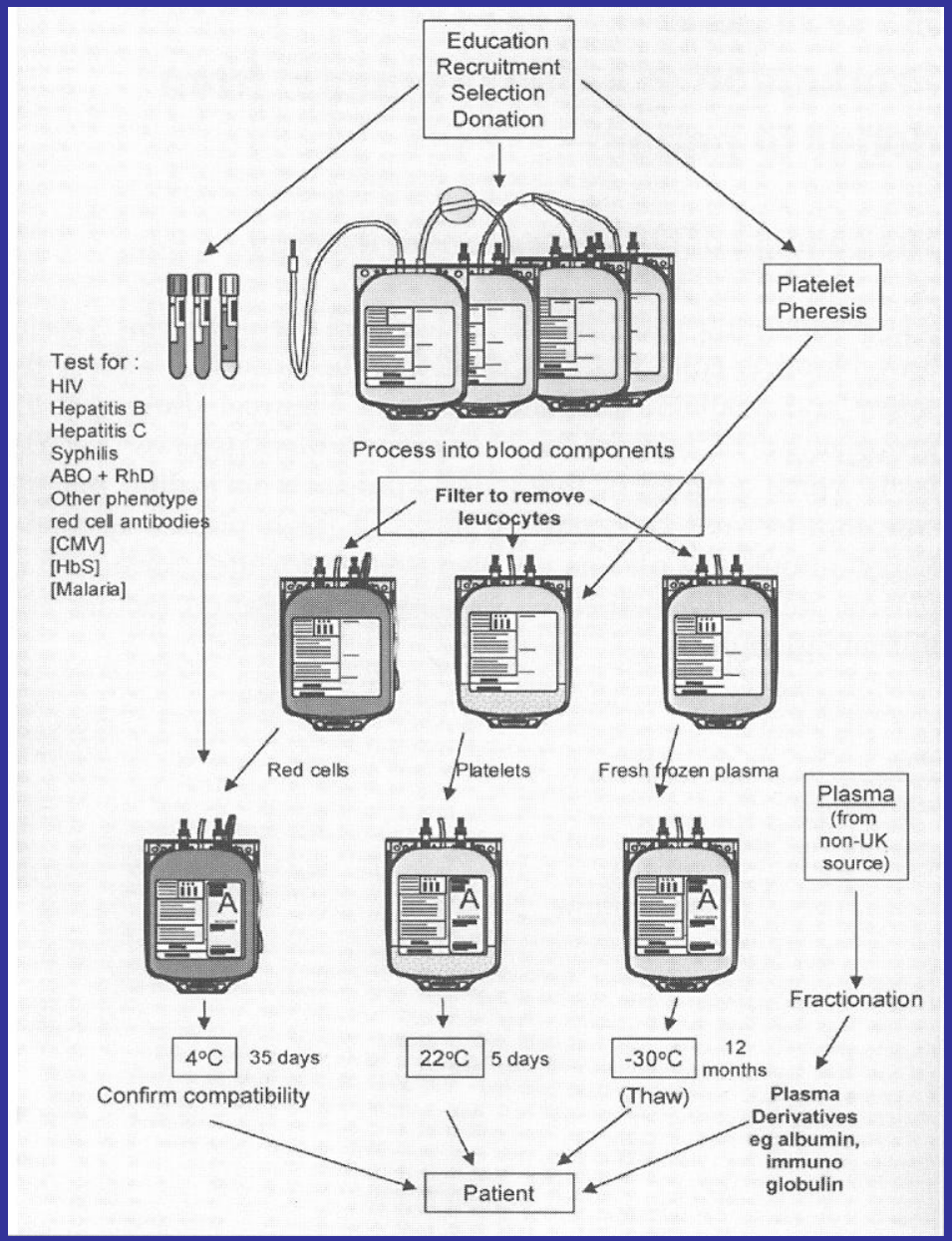
Blood donors

- Medical selection process to protect both recipients and donors
- Minimum age: 17 years
- Maximum age: 70 years (60 for first time donations)
- Donor deferral system to protect donor and patient

Blood donation: infection screening

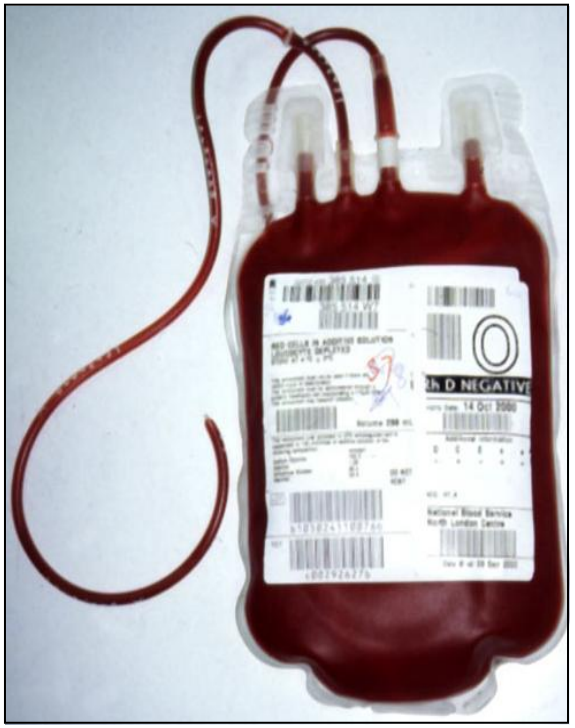
- Hepatitis B, C
- HIV 1 and 2
- HTLV I and II
- Syphilis
- Malaria, T cruzi, West Nile virus if travellers
- CMV for immunosuppressed patients
- No test yet for vCJD

Preparation of Blood Components



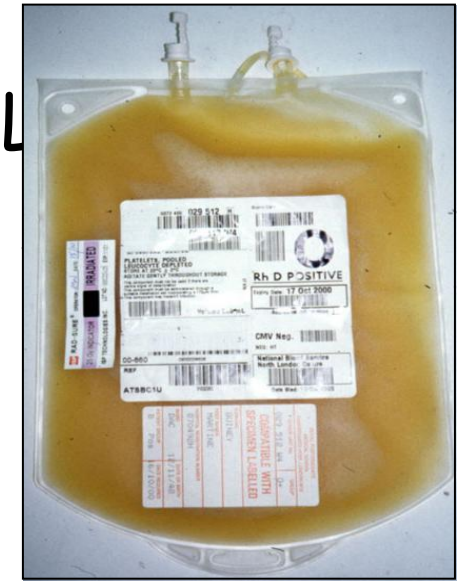
Red cells

- Red cells (350ml; PCV 0.55-0.75)
  - Stored at 2-6 °C for up to 35 days in additive solution (SAGM)
  - 1 unit -> Hb rise by 1g/dl in adult



Platelet concentrates

- Adult therapeutic dose : 300 x 10^9/L
- Stored at controlled 22^0C for up to days with agitation



Platelet concentrates (2)

Indications for platelet transfusions:

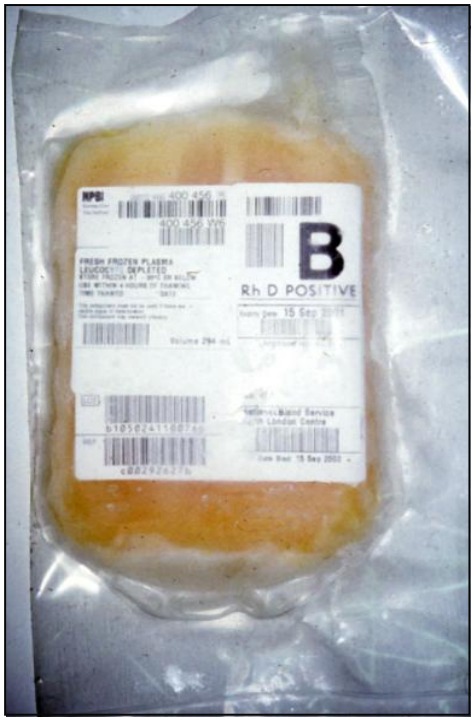
- Bone marrow failure (aplastic anaemia)
- Post chemotherapy, BMT
- Massive blood transfusion (dilutional)
- Platelet dysfunction (clopidogrel, aspirin)
- DIC

Fresh frozen plasma (FFP)

- Stored frozen at -30°C for up to 2 yrs
- Provides replacement for most coagulation factors

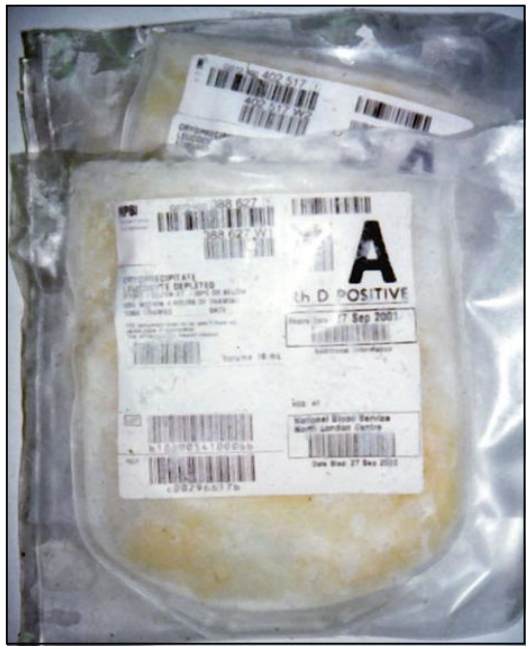
Fresh Frozen Plasma (2)

- Essential to give adequate volume
- Dose: 12-15ml/kg
- ABO compatible
- AB is 'universal donor'
- Definite indications only:
  - Massive blood transfusion
  - DIC
  - Coagulation defect with no available factor concentrate



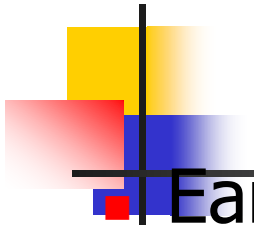
Cryoprecipitate

- Separated by freezing FFP, allowing it to thaw to 4-8°C
- Re-frozen & stored at -30°C for up to 1 yr
- Enriched with FVIII, vWF and fibrinogen



- Indications:
  - DIC
  - Fibrinogen deficiency

Blood Groups and Antibodies



- Early human to human transfusion - fatal
- 1901 - Landsteiner (Nobel Prize winner) discovered ABO blood groups
- Since then - test blood groups of patient and donor (and X-match)
- Should not die of ABO incompatible blood transfusion

ABO Blood Groups

Blood Group	Antigens on Red Cells	Antibodies in Plasma	Frequency in UK
A	A	anti-B	42%
B	B	anti-A	8%
O	nil	anti-A, anti-B	47%
AB	A & B	none	3%

RhD Group- summary

RhD Group	Ag	Ab
RhD positive	D positive	Nil
RhD negative	Nil	Can make anti-D if sensitised

Ordering blood

- Can only be done by a registered medical doctor
- Weigh up advantages vs risks!
- Consider alternatives

- Take blood sample for 'group & screen'
  - ABO and RhD group
  - Screen for antibodies to minor blood groups- RhC, c, E, e; Kell, Duffy, Kidd, Ss, etc.

Blood sampling

- Label request form with:
  - Patient's surname
  - Patients first name(s)
  - Date of birth (not age)
  - Hospital number (or A&E number)
- Label sample bottle at bedside
  - Either hand written or 'printed on request' (if an electronic system is available)
- **Pre-printed Addressograph labels must not be used**

Patient identification

- Positively identify conscious patient by asking him/her to state their name and date of birth
- Check information against patient's identification wrist band or other form of hospital identification (such as photo id)

Record in hospital notes

- Reason for blood transfusion
  - Blood loss
  - Nature of surgery
  - Pre-transfusion Hb
- Number of units to be transfused
- Planned date (and time) of transfusion

Risks of blood transfusion

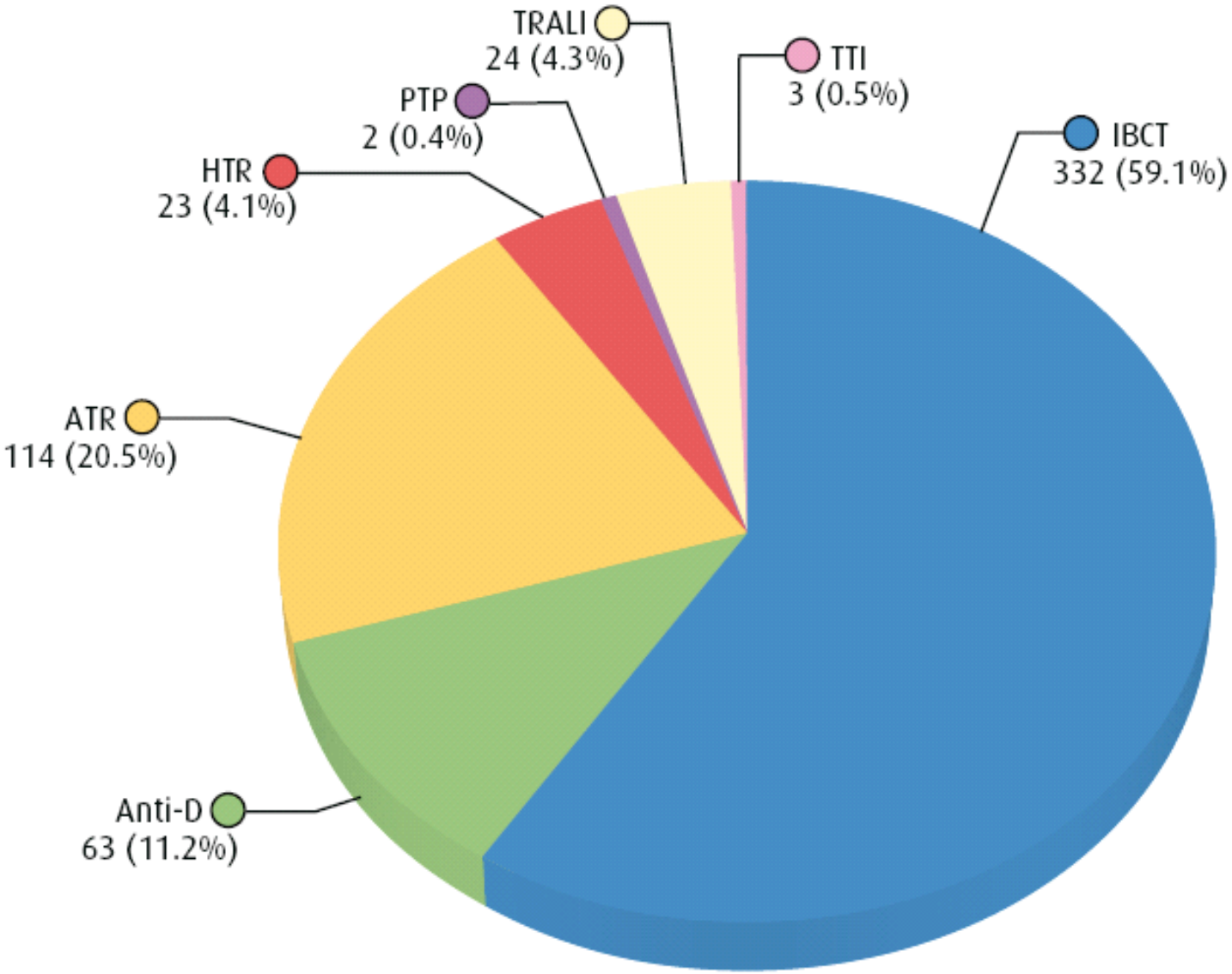
- Infections- hepatitis B- 1 in 0.5 million
  - hepatitis C- 1 in 23 million
  - HIV - 1 in 5 million
  - bacteria (in platelets)
  - protozoa (malaria, T cruzi)
  - vCJD-2 transmissions
- Transfusion reactions
- Transfusion-related acute lung injury
- Getting the wrong blood!

RESULTS FROM THE

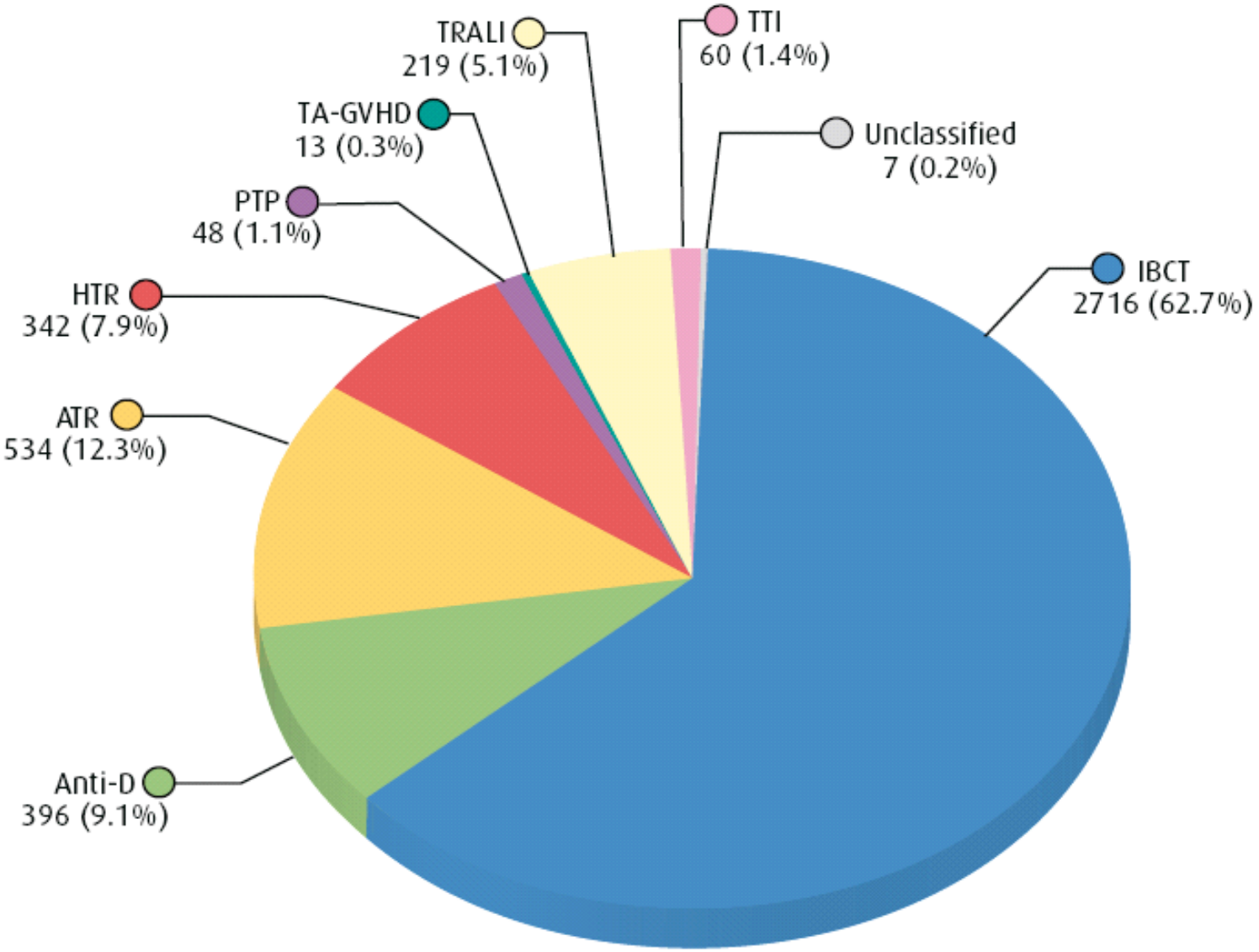
2007

SHOT REPORT

SHOT report 2007 (561 cases)



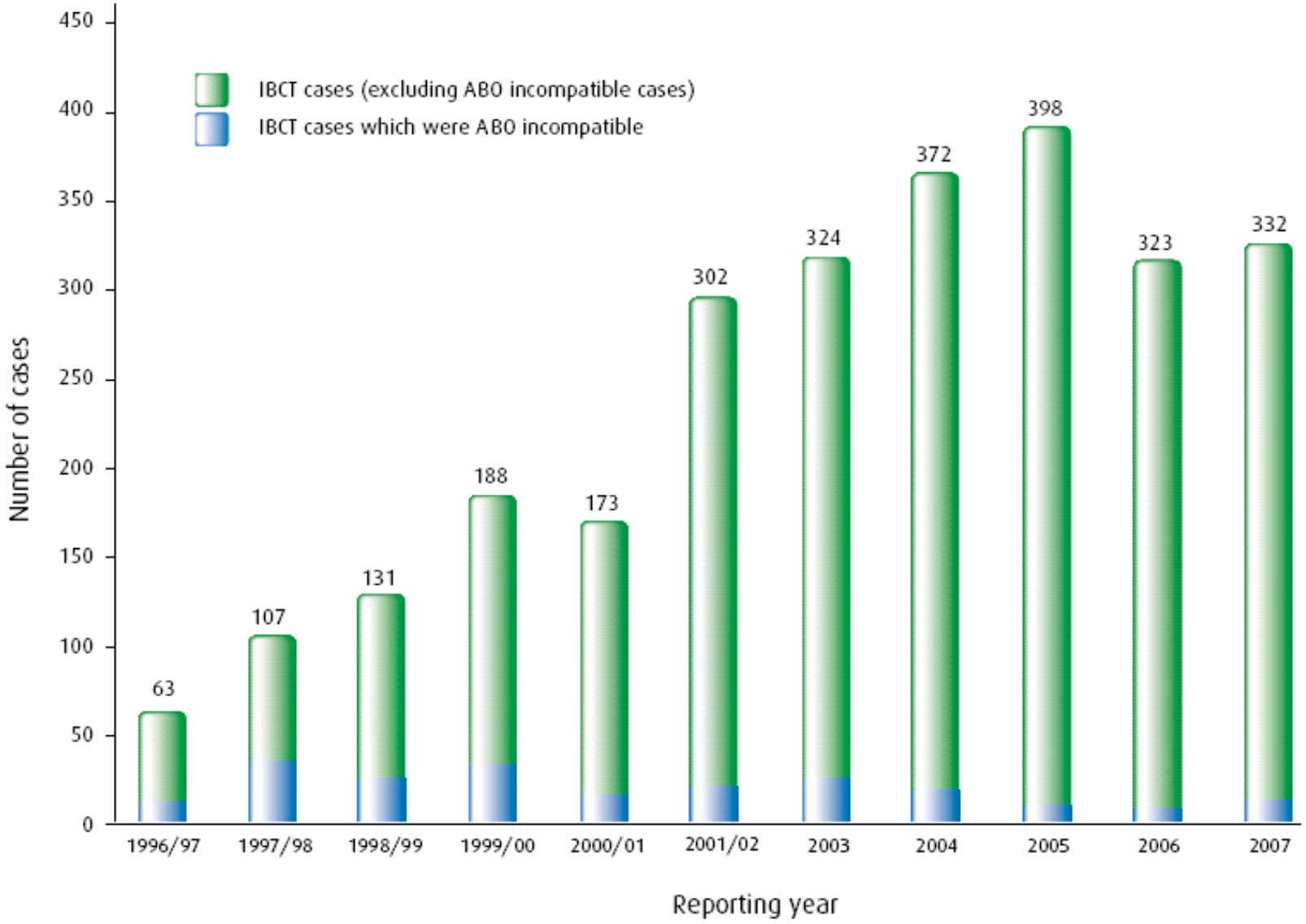
Cumulative data 1996 – 2007 (4335 cases)



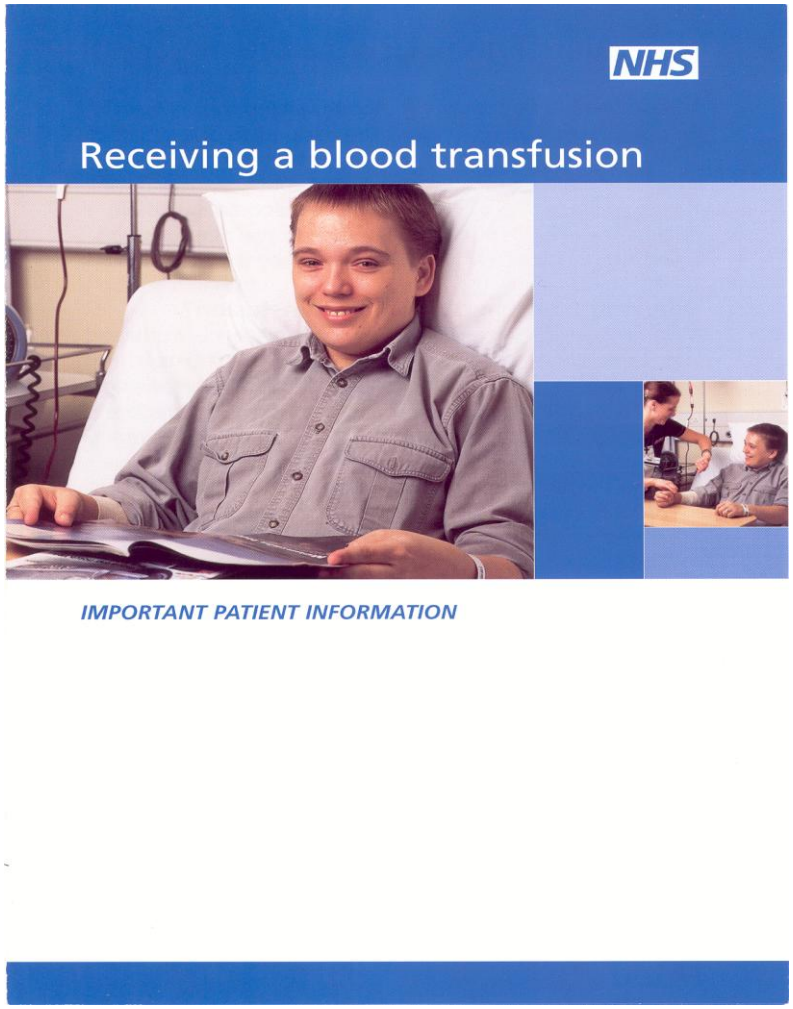
Incorrect blood component transfused (IBCT)

All reported episodes where a patient was transfused with a blood component or plasma product which did not meet the appropriate requirements or that was intended for another patient

ABO incompatible red cell transfusions



Transfusing blood

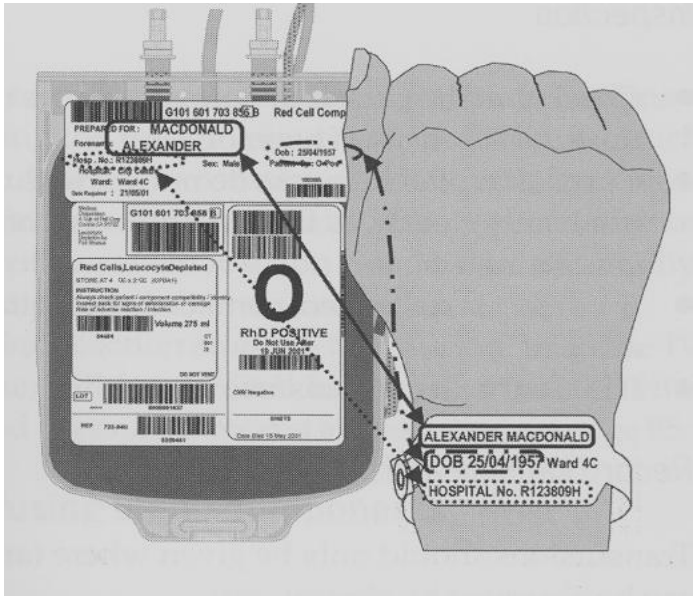


Inform patient!

- Indication
- Benefits
- Risks
- Alternatives

Transfusing blood (2)

- Check blood!!



Check blood pack against patient's wrist band and prescription

The final check!

- Must be done at the bedside
- Replace the wristband if cut off
- Must NOT be done by untrained staff
- If any discrepancy is found:
  - Do NOT transfuse blood
  - Inform blood bank immediately

Adverse effects of transfusion

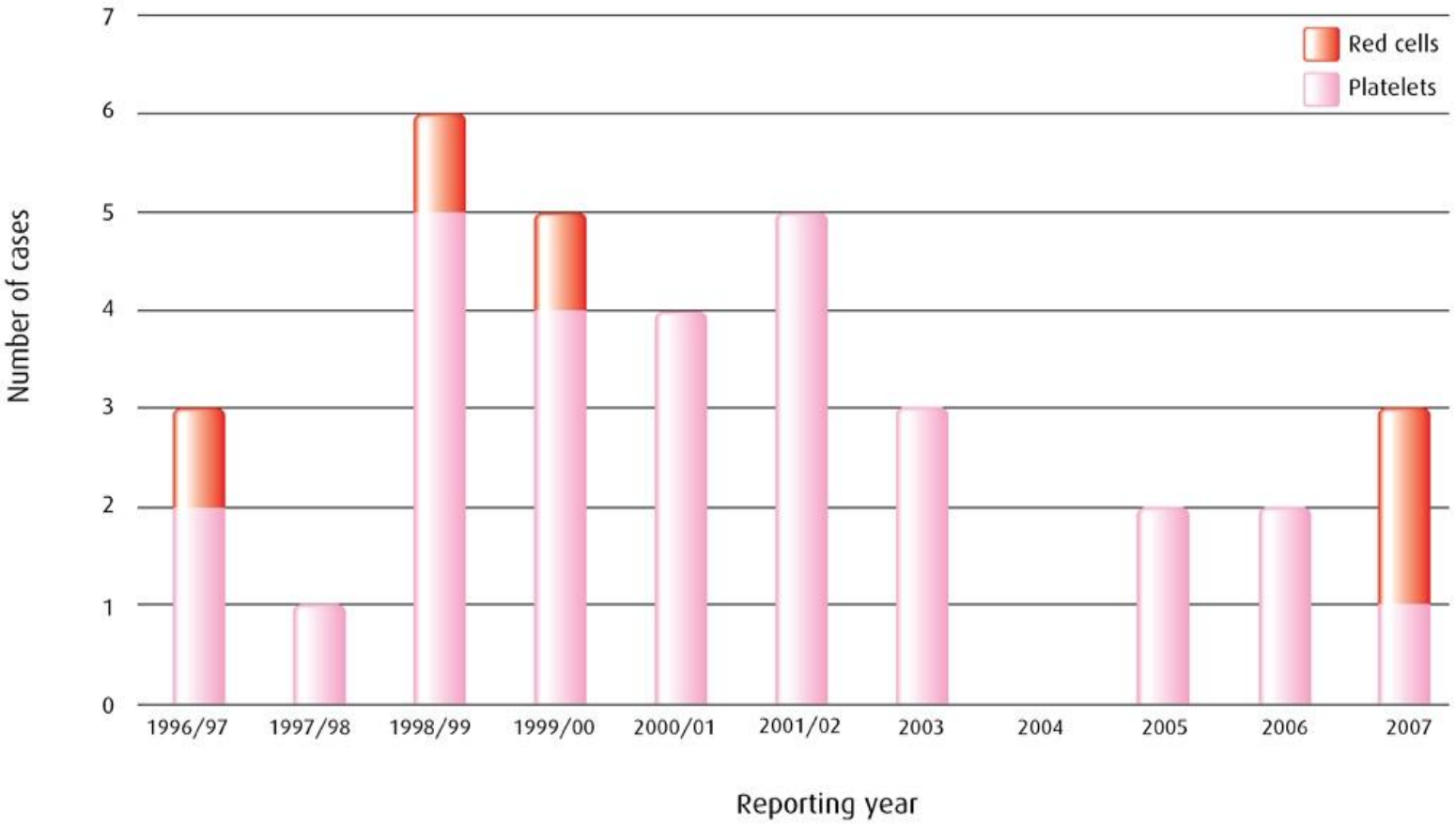
- Immediate reactions < 24 hrs:
  - Immune (ABO incompatibility, TRALI)
  - Non- immune (Bacterial, fluid overload)
- Delayed > 24 hrs:
  - Immune (haemolysis, post-transfusion purpura, graft-vs-host disease
  - Infections (viral, malaria, ? prions)

Cumulative TTI data shown by SHOT report year
(Scotland included from 1998/99 report)

	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2003	2004	2005	2006	2007	Total	Death (due to infection)	Major morbidity	Minor morbidity
Bacteria	3	1	6	5	4	5	3	0	2	2	3	34	8	23	3
HAV	1	0	0	0	0	0	1	0	1	0	0	3	0	2	1
HBV	1	2	2	1	1	0	2	0	1	0	0	10	0	10	0
HCV	1	0	1	0	0	0	0	0	0	0	0	2	0	2	0
HEV	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1
HIV	1	0	0	0	0	0	1	0	0	0	0	2	0	2	0
HTLV	0	0	0	0	1	1	0	0	0	0	0	2	0	2	0
Malaria	1	0	0	0	0	0	1	0	0	0	0	2	1	1	0
Prion	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0
vCJD	0	0	0	0	0	0	1	0	1	1	0	3	3	0	0
Total	**8**	**3**	**9**	**6**	**6**	**6**	**9**	**2**	**5**	**3**	**3**	**60**	**12**	**43**	**5**

Further cumulative data are available at http://www.hpa.org.uk/infections/topics_az/BIBD/menu.htm.

Confirmed bacterial infections, by year of transfusion and type of unit transfused (Scotland included from 10/98)



* In 2004 there was a further incident involving contamination of a pooled platelet pack with *Staphylococcus epidermidis*, which did not meet the TTI definition because transmission to the recipient was not confirmed, but it would seem likely